Hook and Line Survey of Lingcod *(Ophiodon elongatus)* and Rockfish *(Sebastes spp.)* Stocks in the Gulf Islands Region (MSA 17) of the Strait of Georgia, January and February, 1987

C. M. Hand and L. J. Richards

Department of Fisheries and Oceans
Fisheries Research Branch
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

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HOOK AND LINE SURVEY OF LINGCOD (*Ophiodon elongatus*) AND ROCKFISH (*Sebastes* spp.) STOCKS IN THE GULF ISLANDS REGION (MSA 17) OF THE STRAIT OF GEORGIA, JANUARY AND FEBRUARY, 1987

by

C. M. Hand and L. J. Richards

Department of Fisheries and Oceans
Fisheries Research Branch
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

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ABSTRACT

Hand, C. M. and L. J. Richards. 1987. Hook and line survey of lingcod (Ophiodon elongatus) and rockfish (Sebastes spp.) stocks in the Gulf Islands region (MSA 17) of the Strait of Georgia, January and February, 1987. Can. MS Rep. Fish. Aquat. Sci. No. 1957: 57 p.

This report documents part two of a three-part hook and line survey of lingcod stocks in the Gulf Island region of the Strait of Georgia. The purpose of the survey was to compare trends in catch-per-unit-effort (CPUE) obtained from sales-slip data to trends in CPUE obtained under known experimental conditions, and thus to evaluate the representativeness of the sales-slip CPUE. The CPUE of all species caught during the survey decreased with increasing depth. Lingcod CPUE was significantly higher in still, flat water without current than in choppy or moving water, and with commercial gear than with research gear. Quillback rockfish (Sebastes maliger) and copper rockfish (S. caurinus) CPUE were higher using research gear than commercial gear. Lingcod, quillback rockfish and copper rockfish were the dominant species in the catch. Lingcod were more prevalent and larger in the commercial-gear catch while rockfish dominated the research-gear catch. Fishing depth was not related to fish size for any species in the catch.

RÉSUMÉ

Hand, C. M. and L. J. Richards. 1987. Hook and line survey of lingcod (Ophiodon elongatus) and rockfish (Sebastes spp.) stocks in the Gulf Islands region (MSA 17) of the Strait of Georgia, January and February, 1987. Can. MS Rep. Fish. Aquat. Sci. No. 1957: 57 p.

Le présent rapport porte sur la deuxième partie d'un levé de la pêche à la ligne de la morue-lingue dans la région des île Gulf du détroit de Géorgie. Ce levé visait une comparaison des tendances des prises par unité d'effort (PUE) relevées de données inscrites aux bordereaux d'achat et des tendances des PUE obtenues au cours d'expériences; on voulait ainsi évaluer la représentativité des PUE inscrites sur les bordereaux d'achat. Les PUE de toutes les espèces capturées au cours des levés ont baissé en fonction d'une augmentation de la profondeur. Dans le cas de la morue-lingue, les PUE étaient nettement plus élevées dans les eaux calmes exemptes de courant que dans les eaux houleuses ou courante; les engins commerciaux ont aussi généré des PUE plus élevées que les engins expérimentaux. Les PUE du sébaste à dos épineaux (Sebastes maliger) et du sébaste cuivré (S. caurinus) étaient plus élevées dans le cas des engins expérimentaux que des engins commerciaux. La morue-lingue, le sébaste à dos épineaux et le sébaste cuivré étaient les espèces dominant dans les prises. La morue-lingue était plus abondante et plus grosse dans les prises réalisées à l'aide d'engins commerciaux tandis que le sébaste était l'espèce dominante dans les prises réalisées à l'aide d'engins expérimentaux. La profondeur de pêche n'était pas liée à la taille du poisson dans le cas de toutes les espèces capturées.

INTRODUCTION

The Strait of Georgia has supported a hook and line fishery for lingcod since the early 1900s. The stocks were heavily exploited in the late 1920s and in the 1930s, with annual catches of over 2000 t and a peak landing of 3000 t in 1936 (Ketchen et al. 1983). The fishery has declined steadily since the early 1960s to a level of 99 t in 1986. The reason for this decline is unknown but it is believed to reflect a decline in stock abundance due to overfishing (Cass 1985).

The only source of catch and effort data for this hook and line fishery are sales-slip records collected by the Department of Fisheries and Oceans, Statistics Branch. These data have been stored on computer tape since 1967 and include landed weight, days fished and area fished. The catch per unit effort (CPUE) determined from these data has been used to assess lingcod stocks in the past (Cass 1985) but the representativeness of these data as an index of abundance is unknown.

To test the reliability of the sales records, a study was undertaken in 1985 to compare the CPUE determined from the catch and effort data to CPUE determined under known, experimental conditions. In this report, we present the results from the second part of a proposed three-part hook and line survey of Statistical Area 17, conducted during January and February, 1987. Results of part 1, conducted during October to December 1985, are presented in Cass and Richards (1987).

METHODS

The survey design was identical to that used in the previous survey (Cass and Richards 1987). Fishing was again conducted from the F/V BLACK HEART, with two commercial fishermen using commercial gear and live bait, and two research personnel using a standardized hook-and-line method developed in previous surveys (Richards et al. 1985; Richards and Cass 1985). Commercial gear consisted of 23-kg-test monofilament handline with a steel leader and 0.5-kg lead weight. Double Mustad #93664 size-6 hooks with 10-cm spacing were hooked through the snout and dorsal muscle of 15-cm to 20-cm live herring. Research gear consisted of rod and reel with 9-kg-test monofilament and a 7-kg test leader with mooching weights of 170 g. Double Mustad #92553 size 3/0 hooks with 6-cm spacing were hooked through the snout and near the dorsal fin of frozen 12-cm bait herring.

Fishing sites were within the same 1-min-latitude-by-1-min-longitude blocks defined in the previous survey. Fishing within each site was stratified by depth into three intervals: 4-15 fm (10-26 m), 16-25 fm (27-46 m) and 26-35 fm (47-55 m). Fishing positions within a site-depth stratum were changed according to the following:

1. If no fish were caught in the first 10 min.
2. If the CPUE declined, such that no fish were caught in the previous 10 min.
3. If the catch was predominantly dogfish.
4. If more than 10 fish of one species were caught.

Each set (site-depth-time stratum) was fished for a minimum of 10 min per angler, unless any of the above conditions prevailed. Each site-depth stratum was fished on at least two different days. Fishing time was measured separately for each angler with a stop watch and represented the time elapsed while the bait was in position near the bottom. The watch was stopped when a fish was hooked, the line became fouled on the bottom or the line was hauled in. Fishing effort for the set was defined as the sum of the times for each angler, recorded separately for research and commercial gears.

A catch was recorded if the fish was landed or brought to a depth at which it could be visually identified. Landed rockfish and lingcod were measured for fork length to the nearest mm, weighed to the nearest 0.1 kg and examined for sex and maturity. Otoliths were collected from rockfish and the 4th - 8th rays of the second dorsal fin were collected from lingcod for age determination.

Temperature and salinity at depth were recorded at each site using a conductivity-temperature-depth recorder (CTD). Weather and sea conditions were also recorded for each set.

RESULTS AND DISCUSSION

CRUISE SUMMARY

The ten sites that were fished in 1985 were resurveyed in January and February 1987 (Fig. 1). Each site was fished on two separate days except for site 51 which was fished once only. The raw catch and effort data for each species at each time-depth-site stratum are presented in Appendix table 1. Appendix table 2 lists the codes used to identify cloud cover, sea condition, tide, current, depth and gear type. The biological data on individual fish are presented in Appendix table 3 and Appendix table 4 lists the codes used to classify maturity stages in lingcod and rockfish.

CATCH RATES

CPUE at each site-depth stratum for commercial gear and research gear is shown in Table 1. The commercial CPUE for all species combined ranged from 0 to 16.2 fish h^{-1} with the mean and one standard error 5.0 ± 0.72 fish h^{-1}, while total research CPUE ranged from 0 to 13.6 fish h^{-1} (mean 4.9 ± 0.58

fish h^{-1}). Commercial lingcod CPUE ranged from 0 to 15.6 fish hr^{-1} (mean 4.6 ± 0.70 fish h^{-1}) and research rockfish CPUE ranged from 0 to 11.9 fish h^{-1} (mean 3.6 ± 0.51 fish h^{-1}).

Variation in CPUE may be due to a number of factors. The effects of cloud cover, sea condition, tide, current, time of day and fishing method on CPUE were tested separately for each depth interval. As there was no significant difference in CPUE among sites at any depth (Kruskal-Wallis test; $p>0.05$), site values were pooled in subsequent tests. Cloud cover, tidal phase and time of day also had insignificant effects on CPUE (Kruskal-Wallis test; $p>0.05$).

Sea condition and current had a significant effect on lingcod CPUE in the shallow depth interval (Kruskal-Wallis test; $p<0.05$). CPUE was higher in still, flat water than under rippled or choppy conditions and higher in slack water than in a weak or moderate current. CPUE for other species was unaffected by sea condition or current.

Fishing depth had a significant effect on CPUE for lingcod and copper rockfish (Kruskal-Wallis test; $p<0.001$) such that the CPUE decreased with increasing depth. Yelloweye (Sebastes ruberrimus) and quillback rockfish CPUE were unaffected by depth (Fig. 2).

The effect of fishing gear on CPUE was significant for lingcod, quillback rockfish and copper rockfish (Fig. 2). Lingcod CPUE was higher at all comparable sites and depths using commercial gear (sign test; $n=25$, $p<0.001$). Quillback rockfish CPUE was higher at all comparable sites and depths using research gear (sign test; $n=26$, $p<0.001$) as was copper rockfish CPUE ($n=16$, $p<0.001$). Fishing method had no significant effect on yelloweye rockfish CPUE ($n=6$).

SPECIES COMPOSITION

Lingcod was the most abundant species caught (45% of the total), followed by quillback rockfish (24%), copper rockfish (14%), spiny dogfish (Squalus acanthias) (6%) and yelloweye rockfish (2%). The combined catches of greenstripe rockfish (Sebastes elongatus), brown rockfish (S. auriculatus), kelp greenling (Hexagrammos decagrammus), cabezon (Scorpaenichthys marmoratus), rocksole (Lepidopsetta bilineata) and speckled sanddab (Citharichthys stigmaeus) accounted for 8% of the total. The species composition by depth and site is shown in Table 2.

Gear type had a significant effect on species composition at all depths (chi-square; $p<0.001$). The commercial-gear catch was predominantly lingcod and the research-gear catch was predominantly quillback and copper rockfish (Table 3). The species composition was also affected by depth. The proportion of lingcod in the commercial-gear catch decreased and the proportion of dogfish and copper and quillback rockfish increased with depth. Quillback and copper rockfish were equally represented in the research-gear catch at shallow depths but the proportion of quillback rockfish increased and the proportion of copper rockfish decreased with depth (Table 3; Fig. 3).

SIZE COMPOSITION

Length-frequency histograms for copper rockfish, quillback rockfish and lingcod are shown in Figure 4. Gear type had a significant effect on median size of quillback rockfish and lingcod in that commercial gear caught larger fish than research gear (Kruskal-Wallis test; $p<0.05$). The size of copper rockfish was unaffected by gear type. There were no significant differences in median length or weight among depths for any species. Hence, length-frequency distributions were pooled over depth for all species and combined over gear type for copper rockfish.

Mean length and weight for lingcod, quillback rockfish, copper rockfish and yelloweye rockfish are summarized in Table 4 by sex and gear type. There was no significant difference in median length between male and female rockfish. However, female lingcod were significantly larger than male lingcod (Kruskal-Wallis test; $p<0.0001$).

Weight-length relationships for lingcod, quillback rockfish and copper rockfish are shown in Figure 5. Parameters for the weight-length regression are presented in Table 5.

MATURITY

Of the 57 male lingcod caught, 96.5% were mature and, of these, 36.4% were ripe and 63.6% were spent (Table 6). The largest immature male was 59 cm and the smallest mature male was 46 cm. Of the 132 female lingcod caught, 34.8% were mature, of which 50% were ripe, 47.8% were spent and 2.2% were resorbing. The largest immature female was 75 cm and the smallest mature female was 61 cm.

Of the 110 quillback rockfish caught, 93.8% of the females (n=65) and 84.4% of the males (n=45) were mature. Of the mature females, 14.8% contained maturing ova, 32.8% contained mature ova and 52.5% contained fertilized ova. Of the mature males, 52.6% contained developing testes, 10.5% contained developed testes, 10.5% contained spent testes and 26.3% were in the resting stage (Table 6).

Of the 70 copper rockfish caught, 91.4% of the females (n=35) and 94.3% of the males (n=35) were mature. Of the mature females, 9.4% contained maturing ova, 28.1% contained mature ova, 53.1% contained fertilized ova and 9.4% were in the resting stage. Of the mature males, 57.6% contained developing testes, 6.1% contained developed testes, 9.1% were spent and 27.3% were in the resting stage.

TEMPERATURE AND SALINITY PROFILES

Temperature (°C) and salinity (°/..) profiles for each site and date are shown in Figures 6 and 7, respectively. The lowest surface temperature was 3.5°C at site 7. At most sites, the water temperature increased rapidly from the surface to about 8°C at 20 m and then stabilized. Some change in water temperature occurred at sites that were measured on different days in that the surface water was up to 1°C warmer on later dates. Salinities ranged from as low as 25 °/.. at the surface to about 30 °/.. at 60 m. There were similar, rapid changes in salinity in the top 20 m of water. The water column in the Porlier Pass area (sites 15 and 19) was evenly mixed.

COMPARISON OF 1987 SURVEY RESULTS WITH 1985 SURVEY RESULTS

In general, CPUE was lower in 1987 than 1985. The overall lingcod CPUE (both gears combined) in 1987 was 2.8 fish h^{-1} compared with 6.1 fish h^{-1} in 1985. Rockfish CPUE (both gears combined) in 1987 was 2.1 fish h^{-1} compared with 3.5 fish h^{-1} in 1985. There are insufficient data at this time to determine whether this decrease is due to a change in fish abundance or to the survey being two months later in the season than the previous survey.

The difference in CPUE between gear types found in the 1987 survey had also been shown in 1985; lingcod CPUE was higher using commercial gear and rockfish CPUE was higher using research gear. The decline in CPUE with increased depth for lingcod and copper rockfish was common to both surveys, as were the almost insignificant effects of cloud cover, tide, time of day, sea condition and current.

Lingcod comprised a smaller percentage of the total catch in 1987 than in 1985 (45% compared to 70%) and the rockfish fraction was correspondingly more in 1987 (41% compared to 25% in 1985). Once again, there are insufficient data to explain the difference. The depth and gear effects on species composition were similar. Average lengths and weights of the species were similar.

All of the mature lingcod caught in the autumn 1985 survey were in the developing stage, with females having ova of about 1 mm and males having testes filling approximately one half of the body cavity. In the January 1987 lingcod catch, all mature male and female lingcod were either ready to spawn or had spawned. The percentage of male lingcod that were mature was similar between the surveys. However, there were far more immature females caught in January-February 1987 than in October-December 1985 (65% compared to 40%).

The temperature and salinity profiles recorded in January and February 1987 showed a more gradual temperature gradient than those recorded in October to December 1985. Most of the 1987 temperature profiles ranged from about 7°C at the surface to about 8°C at 50 m, whereas in 1985 the surface temperature was generally about 5°C and increased to 9°C at 50 m. There was no obvious difference between salinity profiles.

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Table 1. CPUE (fish h^{-1}) by species and major species groups, for each gear type, site and depth interval during the survey. Depth intervals: 1 5-27 m, 2 28-45 m and 3 46-55 m. Species: LC lingcod, RF all rockfish species, QB quillback rockfish, YE yelloweye rockfish, CO copper rockfish, KG kelp greenling, DF spiny dogfish.

Site	Depth interval	Effort (h)	CPUE							
			Total	LC	RF	QB	YE	CO	KG	DF
COMMERCIAL GEAR										
3	1	1.67	16.20	15.60	0.60	0.60	-	-	-	-
3	2	1.47	12.27	11.59	-	-	-	-	-	0.68
3	3	1.17	1.71	-	-	-	-	-	-	1.71
7	1	1.73	8.08	7.50	0.58	0.58	-	-	-	-
7	2	1.63	4.90	4.29	-	-	-	-	-	0.61
7	3	1.33	8.25	1.50	1.50	0.75	0 .75	-	-	5.25
12	1	1.73	13.27	10.96	2.31	1.73	-	0.58	-	-
12	2	1.53	7.17	6.52	0.65	0.65	-	-	-	-
12	3	1.63	2.45	-	1.84	-	1 .84	-	-	0.61
13	1	1.67	12.00	10.20	1.80	0.60	0 .60	0.60	-	-
13	2	1.87	1.61	1.07	-	-	-	-	-	0.54
13	3	1.60	1.25	-	0.62	-	-	0.62	-	0.62
15	1	2.07	3.87	2.42	0.97	0.97	-	-	-	-
15	2	2.17	3.69	2.77	0.46	-	-	0.46	-	-
15	3	1.70	5.29	1.18	3.53	3.53	-	-	-	-
19	1	1.60	2.50	2.50	-	-	-	-	-	-
19	2	1.27	2.37	2.37	-	-	-	-	-	-
19	3	2.10	1.43	1.43	-	-	-	-	-	-
27	1	3.10	3.23	2.90	0.32	-	-	0.32	-	-
27	2	1.57	3.83	2.55	0.64	0.64	-	-	-	0.64
27	3	1.93	4.14	2.07	-	-	-	-	-	1.55
30	1	1.53	11.74	11.74	-	-	-	-	-	-
30	2	1.57	2.55	2.55	-	-	-	-	-	-
30	3	1.60	4.38	3.75	0.63	-	0 .63	-	-	-
51	1	0.93	4.29	3.21	1.07	-	-	1.07	-	-
51	2	0.93	2.14	2.14	-	-	-	-	-	-
51	3	0.90	0.00	-	-	-	-	-	-	-
53	1	1.80	3.89	3.33	0.56	-	-	0.56	-	-
53	2	1.80	3.89	3.89	-	-	-	-	-	-
53	3	1.47	0.00	-	-	-	-	-	-	-
RESEARCH GEAR										
3	1	1.43	12.56	0.70	11.86	4.88	-	6.98	-	-
3	2	1.60	0.62	-	0.62	0.62	-	-	-	-
3	3	1.10	6.36	-	0.91	0.91	-	-	-	3.64
7	1	1.57	5.74	0.64	5.11	2.55	-	2.55	-	-
7	2	1.43	2.79	-	2.79	2.79	-	-	-	-
7	3	1.10	10.00	-	6.36	5.45	0 .91	-	-	3.64
12	1	1.50	10.00	1.33	8.67	5.33	-	3.33	-	-
12	2	1.60	3.13	-	1.88	1.25	0 .63	-	-	-
12	3	1.53	1.96	-	1.96	1.96	-	-	-	-
13	1	1.53	3.91	0.65	2.61	1.96	-	0.65	-	-
13	2	1.50	5.33	0.67	0.67	0.67	-	-	-	0.67

Table 1 (cont'd)

Site	Depth interval	Effort (h)	CPUE Total	LC	RF	QB	YE	CO	KG	DF
RESEARCH GEAR (cont'd)										
13	3	1.43	3.49	-	2.79	1.40	-	0.70	-	-
15	1	1.47	13.64	-	9.55	5.45	-	4.09	2.05	-
15	2	2.10	3.81	-	1.90	1.43	-	0.48	1.43	-
15	3	1.23	4.86	-	4.86	4.86	-	-	-	-
19	1	1.57	5.11	0.64	4.47	-	-	4.47	-	-
19	2	1.17	2.57	-	0.86	-	-	0.86	0.86	-
19	3	1.83	1.09	-	1.09	0.55	-	0.55	-	-
27	1	2.43	7.81	-	6.99	4.11	-	2.88	0.82	-
27	2	1.50	2.67	-	0.67	0.67	-	-	0.67	-
27	3	1.37	0.73	-	-	-	-	-	-	0.73
30	1	1.60	7.50	1.25	6.25	2.50	-	3.75	-	-
30	2	1.57	1.28	-	1.28	0.64	0 .64	-	-	-
30	3	1.97	2.03	-	1.02	1.02	-	-	0.51	-
51	1	0.73	5.45	1.36	4.09	-	-	4.09	-	-
51	2	0.87	3.46	-	3.46	3.46	-	-	-	-
51	3	0.80	2.50	-	2.50	2.50	-	-	-	-
53	1	1.63	6.12	-	5.51	3.67	-	1.84	-	-
53	2	1.43	5.58	0.70	4.19	2.79	-	1.40	-	-
53	3	1.00	5.00	-	4.00	2.00	-	1.00	-	-

Table 2. Species composition for the all-gear catch during the survey, summarized by depth and site. LC lingcod, QB quillback rockfish, CO copper rockfish, YE yelloweye rockfish, GS greenstripe rockfish, BR brown rockfish, KG kelp greenling, CA cabezon, DF spiny dogfish, RS rock sole, SS speckled sanddab and NF number of fish caught.

Depth	Site	LC	QB	CO	YE	GS	BR	KG	CA	DF	RS	SS	NF
5-27 m													
	3	0.60	0.16	0.24	-	-	-	-	-	-	-	-	45
	7	0.61	0.22	0.17	-	-	-	-	-	-	-	-	23
	12	0.61	0.24	0.16	-	-	-	-	-	-	-	-	38
	13	0.67	0.19	0.11	0.04	-	-	-	-	-	-	-	27
	15	0.19	0.33	0.22	-	-	-	0.11	0.15	-	-	-	27
	19	0.38	-	0.62	-	-	-	-	-	-	-	-	13
	27	0.31	0.34	0.28	-	-	-	0.07	-	-	-	-	29
	30	0.67	0.13	0.20	-	-	-	-	-	-	-	-	30
	51	0.50	-	0.50	-	-	-	-	-	-	-	-	8
	53	0.35	0.35	0.24	-	-	0.06	-	-	-	-	-	17
28-45 m													
	3	0.89	0.05	-	-	-	-	-	-	0.05	-	-	19
	7	0.58	0.33	-	-	-	-	-	-	0.08	-	-	12
	12	0.63	0.19	-	0.06	-	-	-	-	-	-	0.13	16
	13	0.27	0.09	-	-	-	-	-	-	0.18	-	0.45	11
	15	0.38	0.19	0.13	-	-	-	0.19	0.13	-	-	-	16
	19	0.50	-	0.17	-	-	-	0.17	-	-	-	-	6
	27	0.40	0.20	-	-	-	-	0.10	-	0.10	0.20	-	10
	30	0.67	0.17	-	0.17	-	-	-	-	-	-	-	6
	51	0.40	0.60	-	-	-	-	-	-	-	-	-	5
	53	0.53	0.33	0.13	-	-	-	-	-	-	-	-	15
46-55 m													
	3	-	0.11	-	-	-	-	-	-	0.67	0.11	0.11	9
	7	0.09	0.32	-	0.09	-	-	-	-	0.50	-	-	22
	12	-	0.43	-	0.43	-	-	-	-	0.14	-	-	7
	13	-	0.29	0.29	-	0.14	-	-	-	0.14	-	0.14	7
	15	0.13	0.80	-	-	-	-	-	0.07	-	-	-	15
	19	0.60	0.20	0.20	-	-	-	-	-	-	-	-	5
	27	0.44	-	-	-	-	-	-	0.11	0.44	-	-	9
	30	0.55	0.18	-	0.09	-	-	0.09	-	-	-	0.09	11
	51	-	1.00	-	-	-	-	-	-	-	-	-	2
	53	-	0.57	0.29	-	0.14	-	-	-	-	-	-	7

Table 3. The effect of depth on species composition for each gear type. LC lingcod, QB quillback rockfish, CO copper rockfish, DF dogfish. Species with an expected frequency of less than 5 were excluded from the analysis.

	Species composition (%)			
Depth	LC	QB/CO	DF	Total number
a) Commercial gear				
5-27 m	90.2	9.8	0	133
28-45 m	89.8	4.3	5.8	69
46-55 m	43.6	20.5	35.9	39
Total	199	24	18	241

$\chi^2 = 67.1$, df = 4, $p<0.001$

	Species composition (%)			
Depth	LC	QB	CO	Total number
b) Research gear				
5-27 m	8.1	45.0	46.8	111
28-45 m	7.7	76.9	15.4	26
46-55 m	0	89.3	10.7	28
Total	11	95	59	165

$\chi^2 = 23.6$, df = 4, $p<0.001$

Table 4. Mean fork length and weight with one standard error for lingcod and quillback, copper and yelloweye rockfish, by sex and gear type.

	Males					Females				
Species	n	Length (cm)	SE	Weight (kg)	SE	n	Length (cm)	SE	Weight (kg)	SE
Commercial Gear										
Lingcod	52	58.9	0.75	2.0	0.09	126	69.1	0.83	3.6	0.15
Quillback	0	-	-	-	-	15	35.3	0.86	0.9	0.08
Copper	1	37.5	-	0.9	-	6	34.3	1.82	0.8	0.15
Yelloweye	2	44.2	1.70	1.6	0.18	4	48.7	2.87	2.4	0.37
Research Gear										
Lingcod	5	51.7	1.79	1.4	0.18	5	54.2	2.40	1.5	0.21
Quillback	45	32.6	0.49	0.7	0.03	50	33.3	0.59	0.8	0.03
Copper	34	32.1	0.58	0.6	0.03	29	32.8	0.85	0.7	0.07
Yelloweye	3	34.7	5.46	0.9	0.37	0	-	-	-	-

Table 5. Parameter estimates for the weight-length (g-cm) relationship $W=aL^b$, by species with the coefficient of determination (r^2) and mean square error, as calculated from the linear regression log(weight)=log(a)+blog(length).

Species	Sex	N	a	b	r^2	M.S.E.
Lingcod	M	56	0.0071	3.071	0.903	0.042
	F	131	0.0020	3.387	0.956	0.046
Quillback Rockfish	comb.	105	0.0178	3.036	0.930	0.043
Copper Rockfish	comb.	69	0.0162	3.031	0.935	0.044

Table 6. Frequency of different maturity stages for male and female lingcod and rockfish caught during the survey. Maturity codes are described in Appendix table 4.

Species	Maturity stage	Male		Female	
		n	%	n	%
Lingcod	1	0	-	7	5.3
	2	2	3.5	79	59.8
	7	20	35.1	23	17.4
	8	35	61.4	22	16.7
	9	0	-	1	0.8
Quillback	1	7	15.6	4	6.2
	2	0	-	9	13.8
	3	20	44.4	20	30.8
	4	4	8.9	32	49.2
	6	4	8.9	0	-
	7	10	22.2	0	-
Copper	1	2	5.7	3	8.6
	2	0	-	3	8.6
	3	19	54.3	9	25.7
	4	2	5.7	17	48.6
	6	3	8.6	0	-
	7	9	25.7	3	8.6

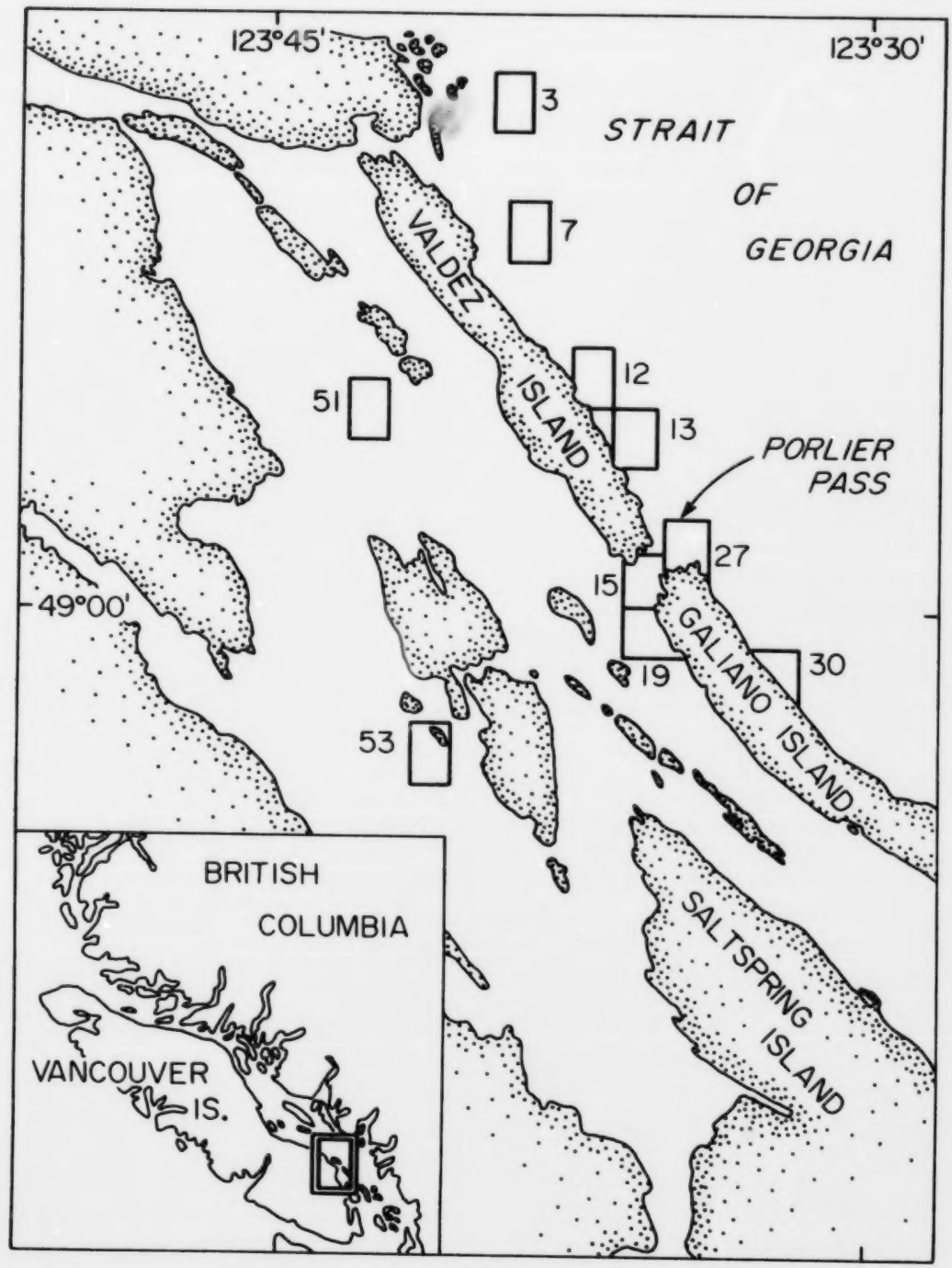


Fig. 1. Locations of lingcod survey sites, January and February, 1987.

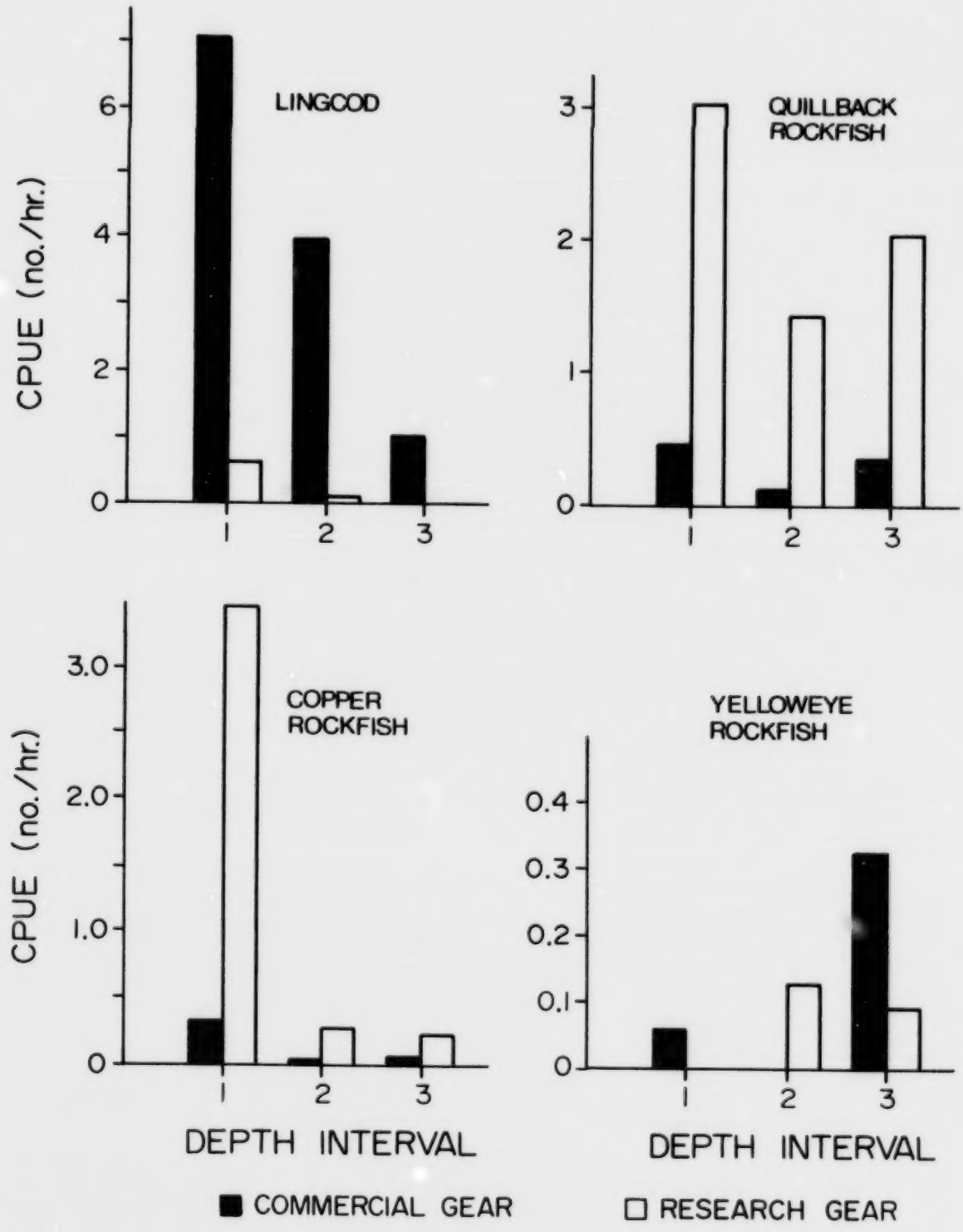


Fig. 2. Catch per unit effort (no./h) by depth interval and gear type for lingcod and quillback, copper and yelloweye rockfish. Depth intervals; 1 5-27 m, 2 28-45 m, 3 46-55 m.

Fig. 3. Species composition (%) by depth interval and gear type for LC lingcod, QB quillback rockfish, CO copper rockfish, and YE yelloweye rockfish.

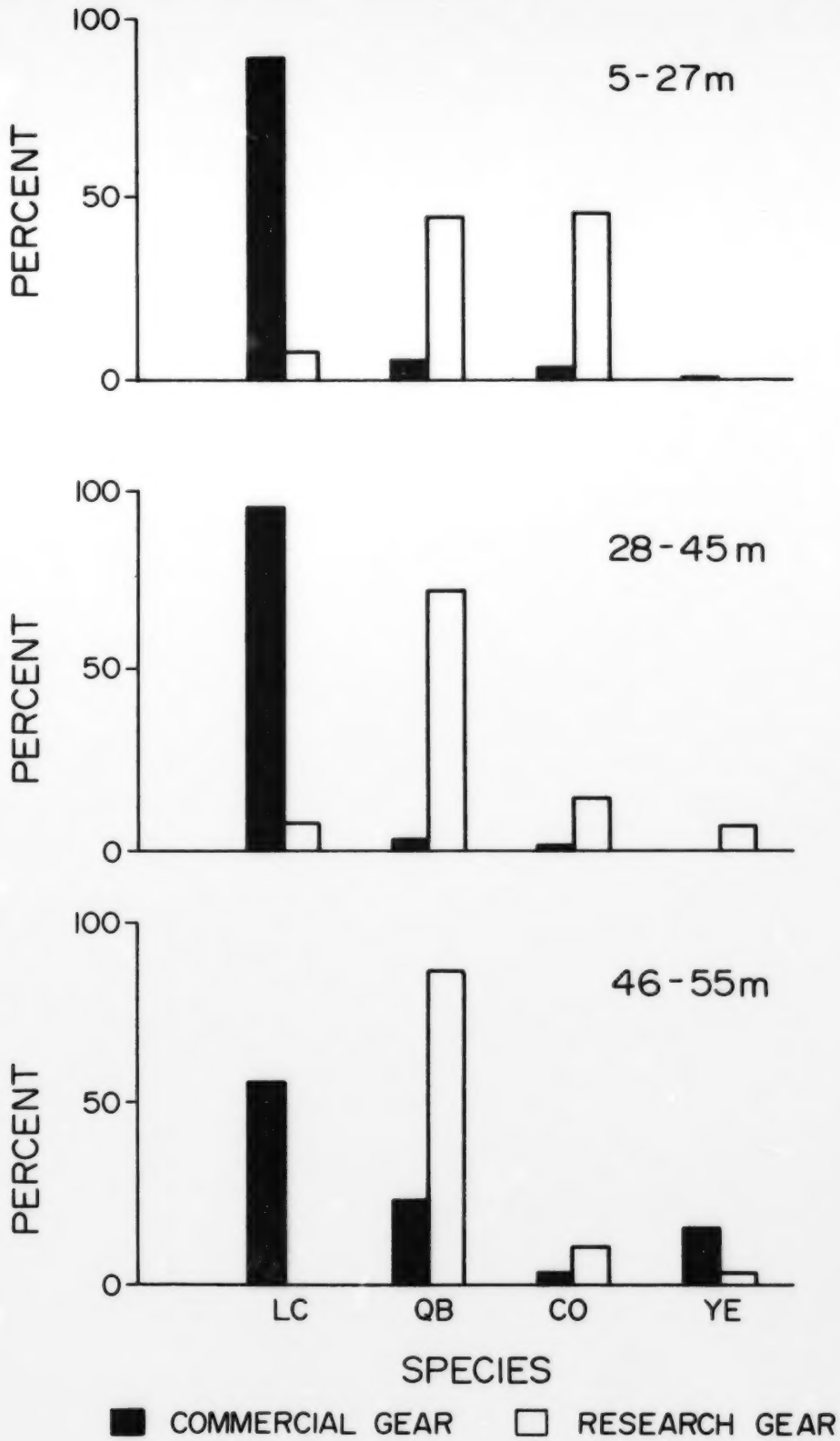
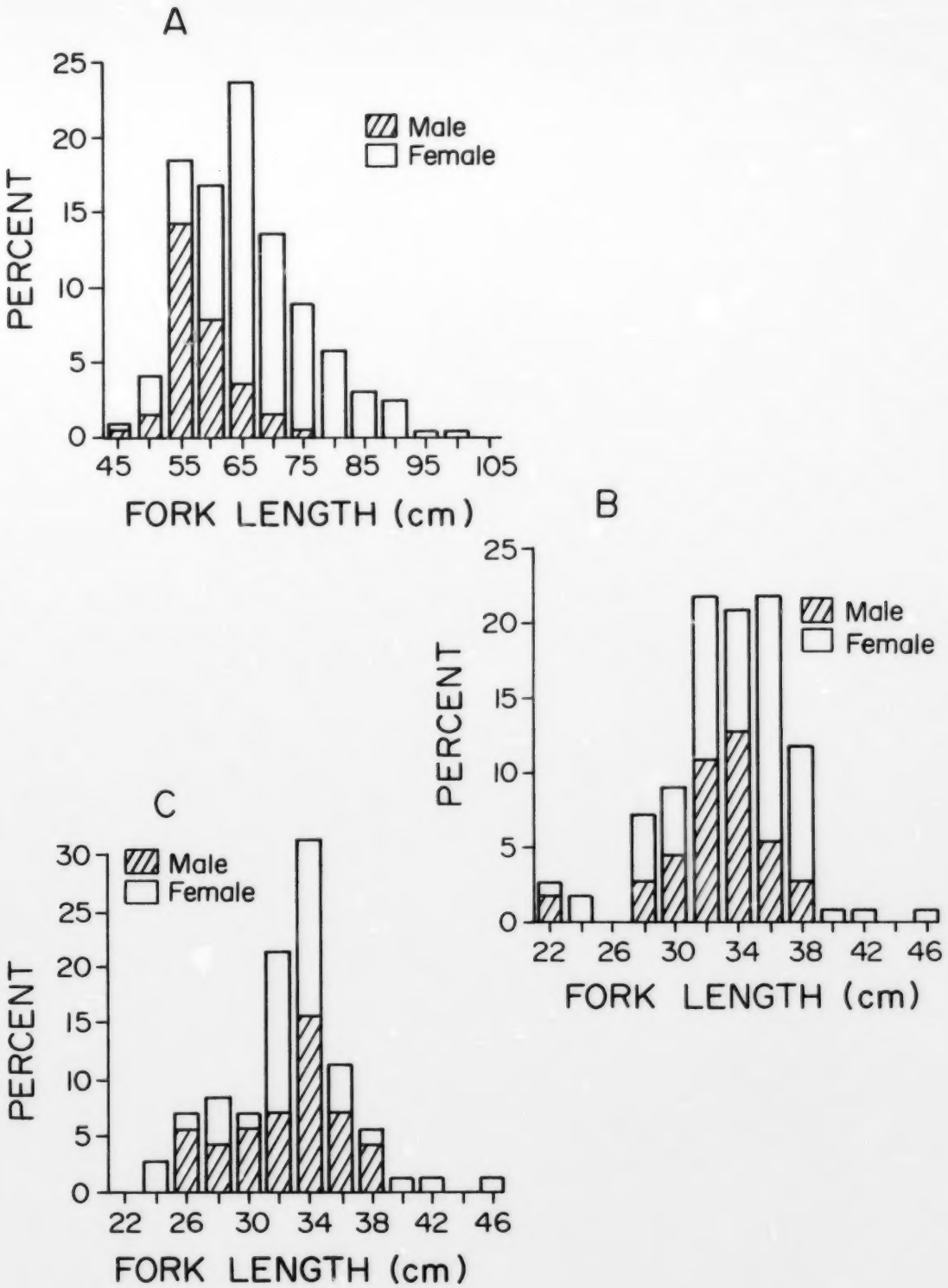

100
50
0
PERCENT
5-27m
28-45m
46-55m
LC
QB
CO
YE
SPECIES
COMMERCIAL GEAR
RESEARCH GEAR

Fig. 4. Length-frequency histograms for: A. lingcod caught with commercial gear, B. quillback rockfish caught with research gear, and C. copper rockfish, both gears combined. Lengths shown represent the midpoint of the size interval.


A
PERCENT
25
20
15
10
5
0
Male
Female
45 55 65 75 85 95 105
FORK LENGTH (cm)
B
PERCENT
25
20
15
10
5
0
Male
Female
22 26 30 34 38 42 46
FORK LENGTH (cm)
C
PERCENT
30
25
20
15
10
5
0
Male
Female
22 26 30 34 38 42 46
FORK LENGTH (cm)

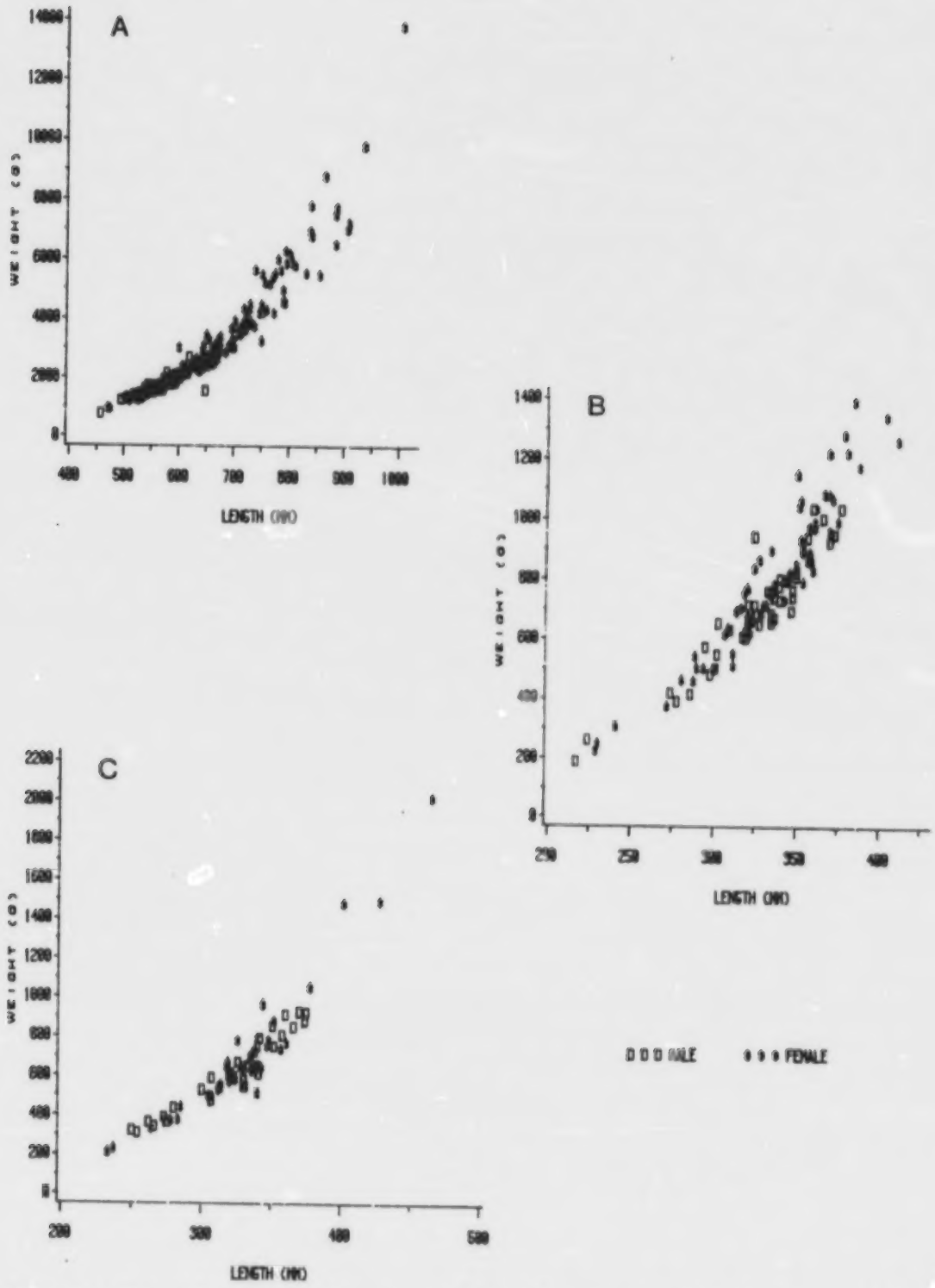


Fig. 5. The relationship between weight (g) and length (mm) for A. lingcod, B. quillback rockfish, and C. copper rockfish.

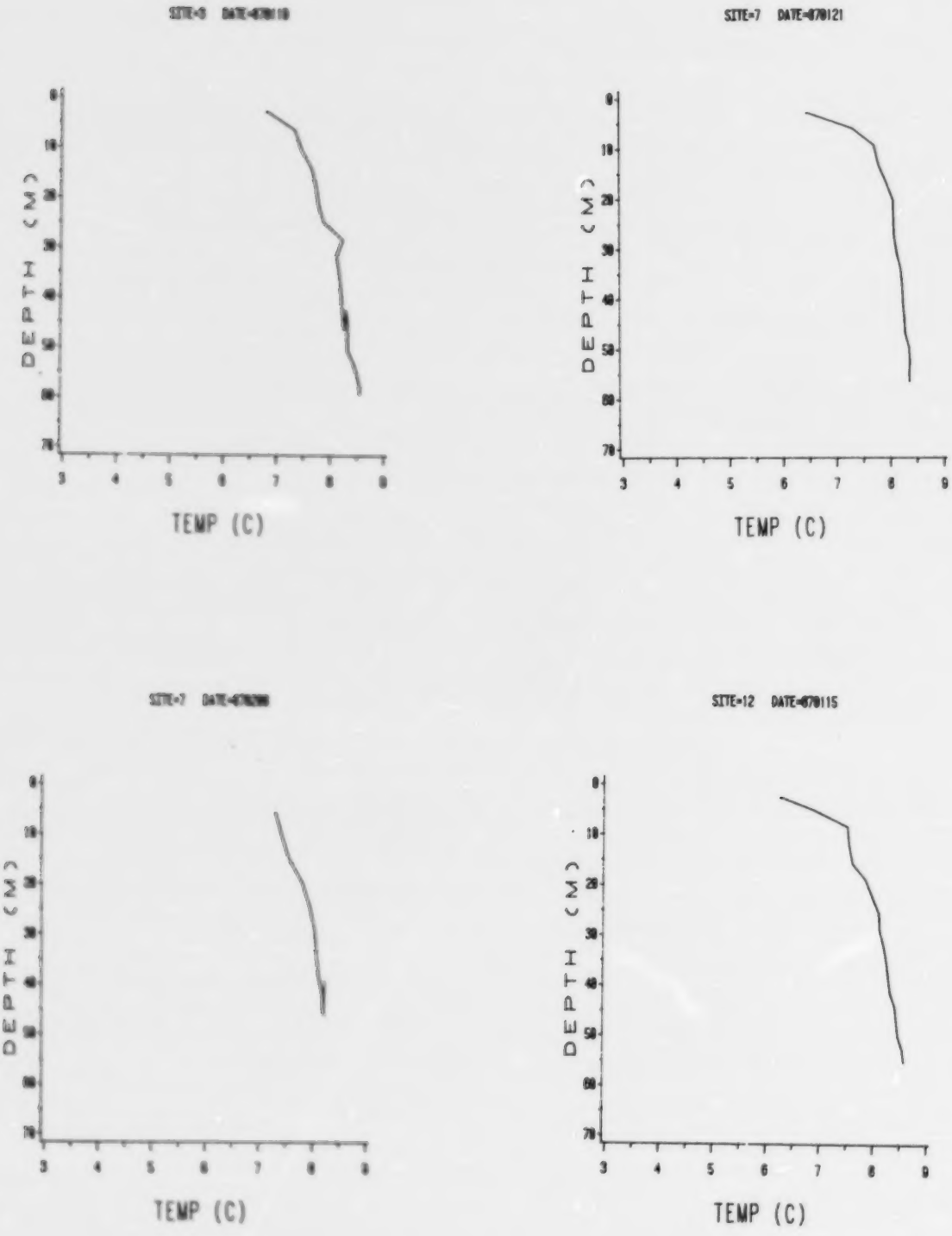
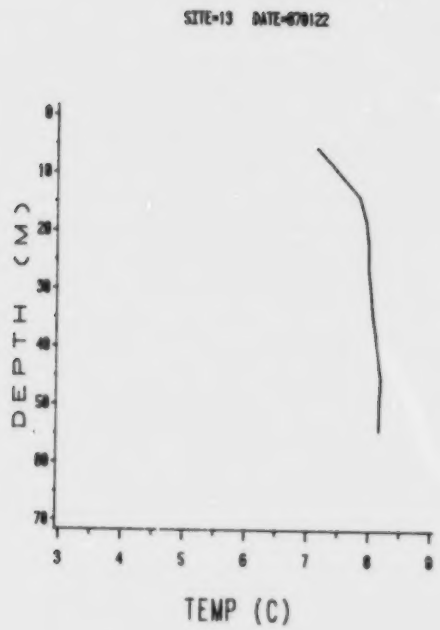
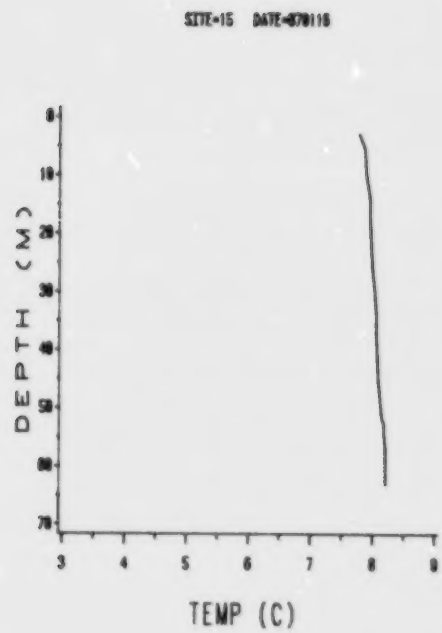
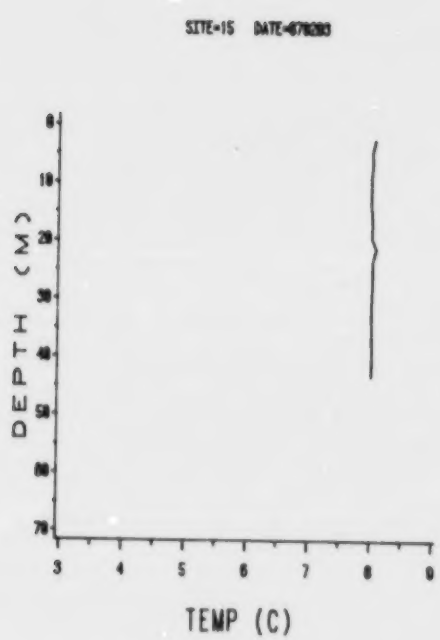


Fig. 6. Temperature (°C) profiles by site and date for survey locations.


SITE=13 DATE=670122
DEPTH (M)
TEMP (C)


SITE=15 DATE=670116
DEPTH (M)
TEMP (C)


SITE=15 DATE=670203
DEPTH (M)
TEMP (C)

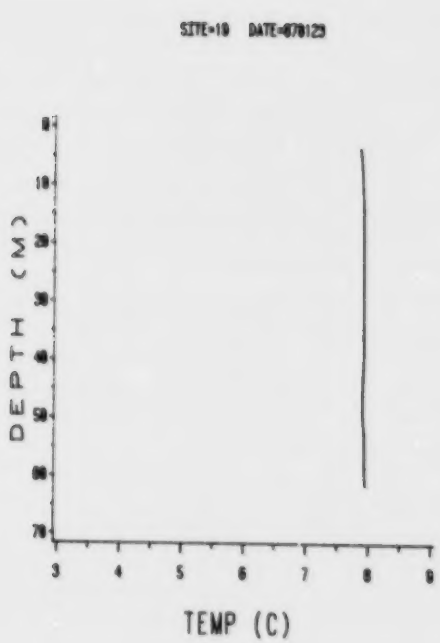
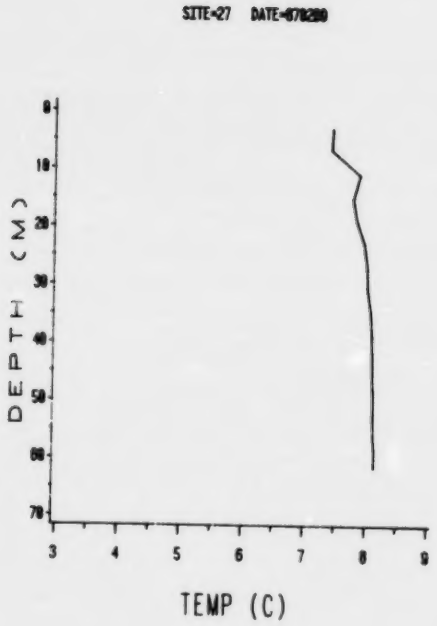
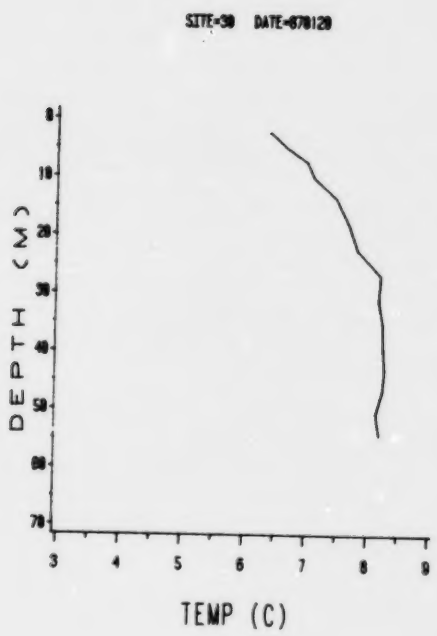
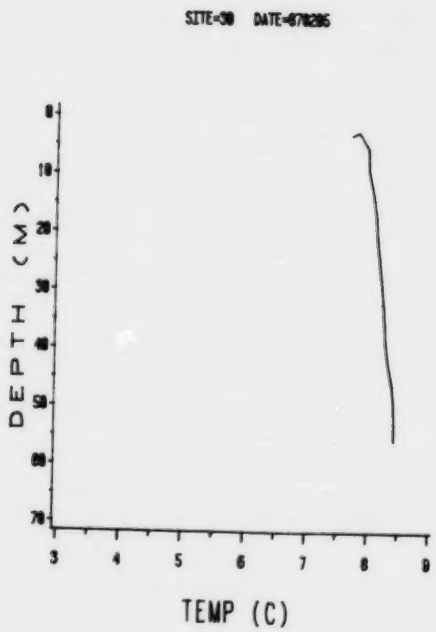

SITE=19 DATE=670123
DEPTH (M)
TEMP (C)

Fig. 6 (cont'd).


SITE=27 DATE=678289
DEPTH (M)
TEMP (C)


SITE=30 DATE=678129
DEPTH (M)
TEMP (C)


SITE=30 DATE=678285
DEPTH (M)
TEMP (C)

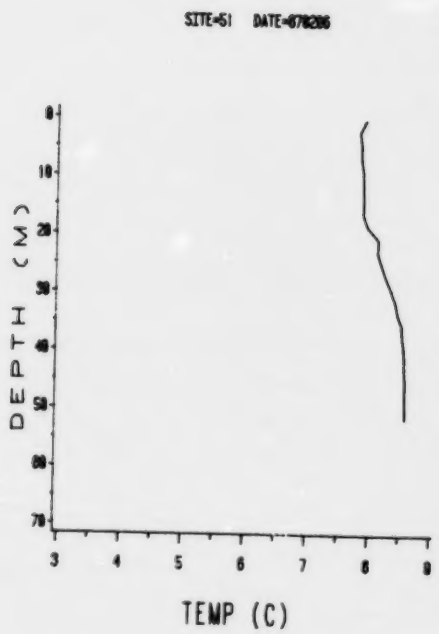
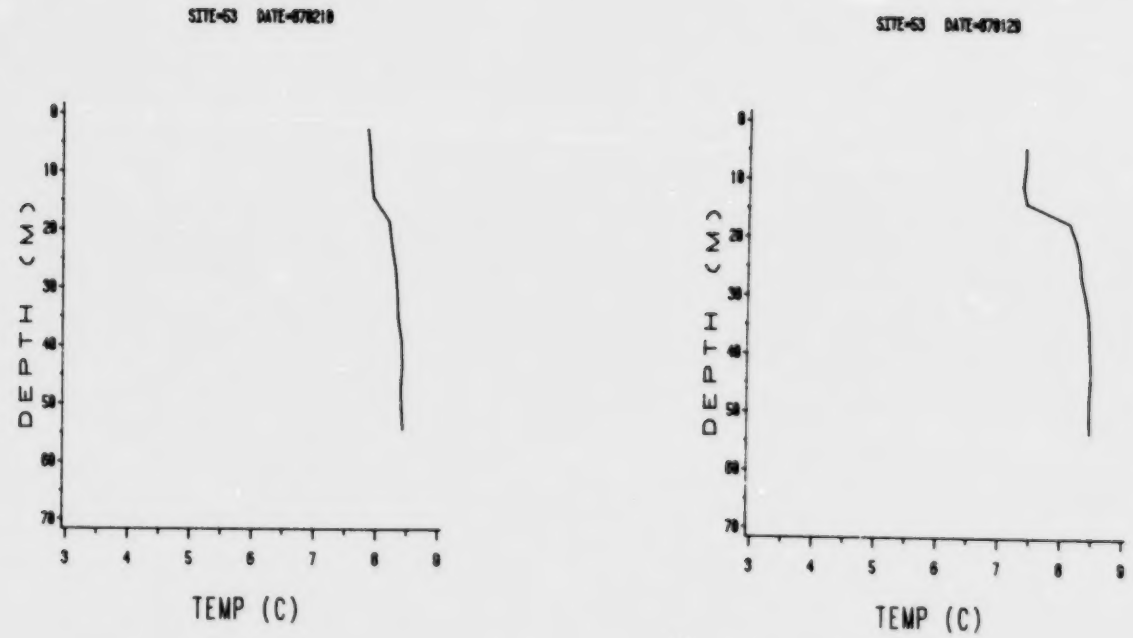

SITE=51 DATE=678286
DEPTH (M)
TEMP (C)

Fig. 6 (cont'd).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DEPTH (M)
TEMP (C)
SITE=63 DATE=670129
DEPTH (M)
TEMP (C)

Fig. 6 (cont'd).

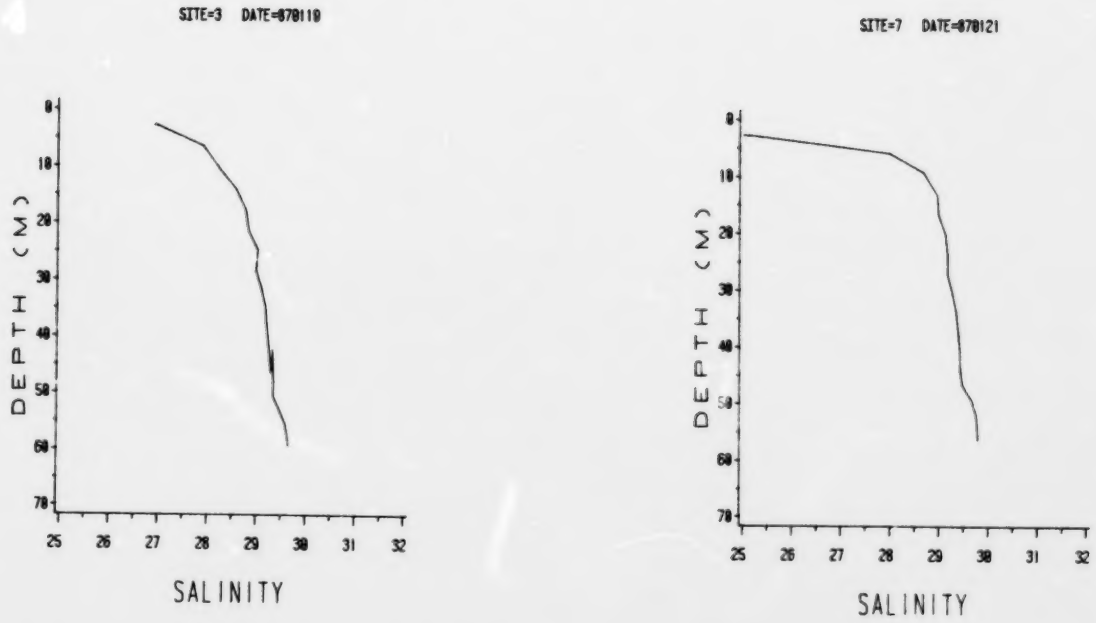
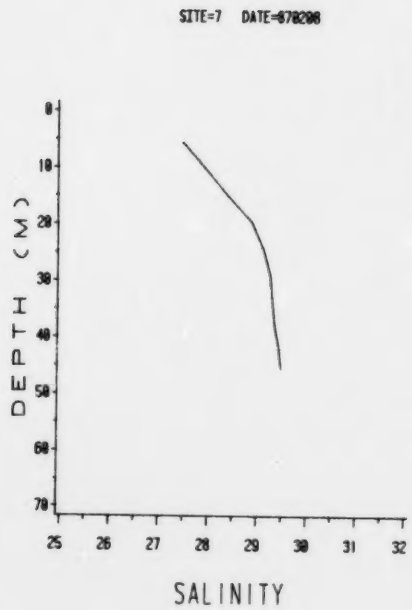
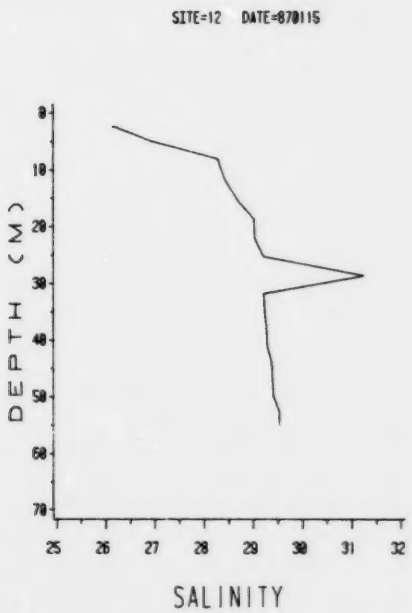
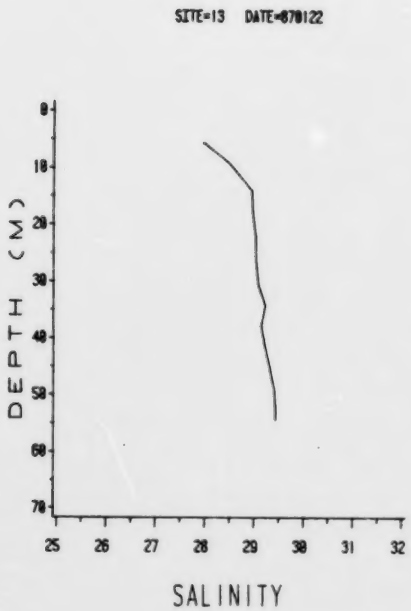


Fig. 7. Salinity (‰) profiles by site and date for survey locations.


SITE=7 DATE=678208
DEPTH (M)
0
10
20
30
40
50
60
70
25
26
27
28
29
30
31
32
SALINITY


SITE=12 DATE=678115
DEPTH (M)
0
10
20
30
40
50
60
70
25
26
27
28
29
30
31
32
SALINITY


SITE=13 DATE=678122
DEPTH (M)
0
10
20
30
40
50
60
70
25
26
27
28
29
30
31
32
SALINITY

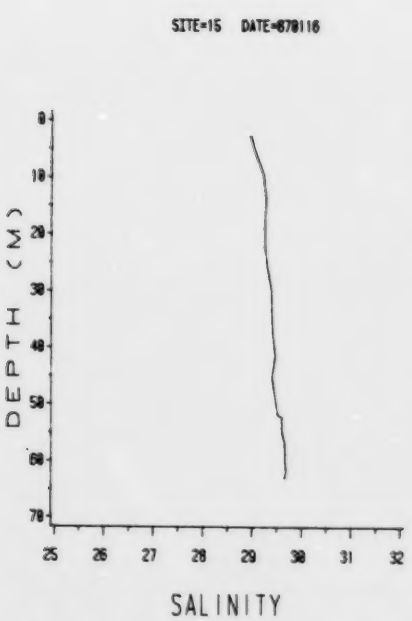
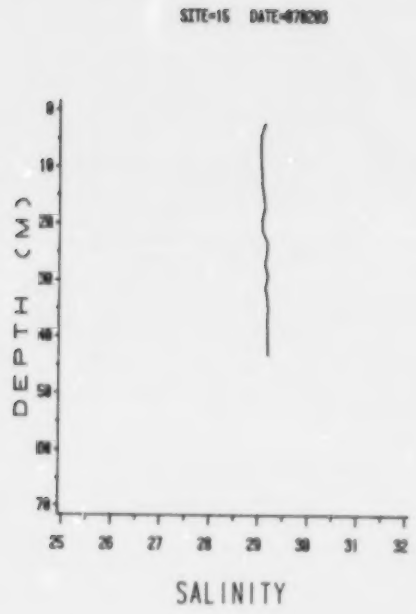
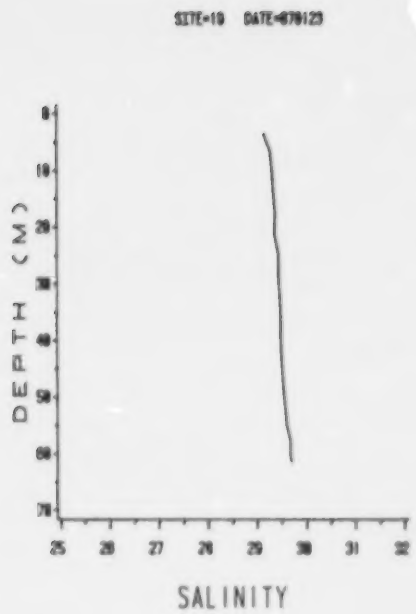
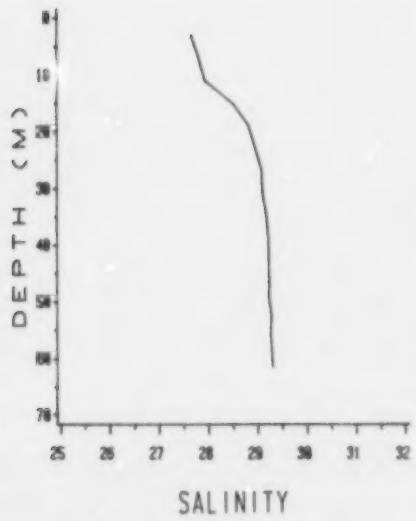

SITE=15 DATE=678116
DEPTH (M)
0
10
20
30
40
50
60
70
25
26
27
28
29
30
31
32
SALINITY

Fig. 7 (cont'd).


DEPTH (M)
SALINITY


DEPTH (M)
SALINITY


DEPTH (M)
SALINITY

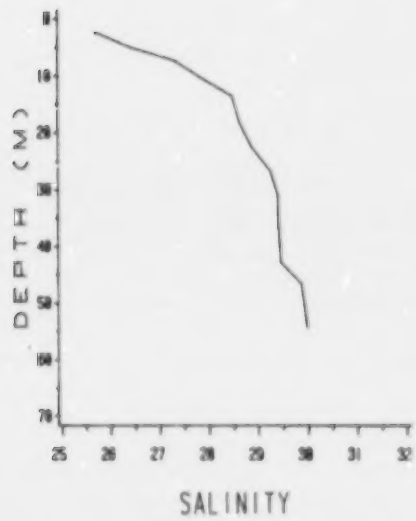
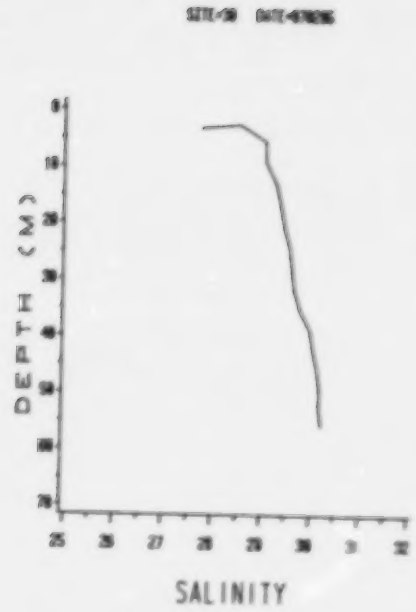
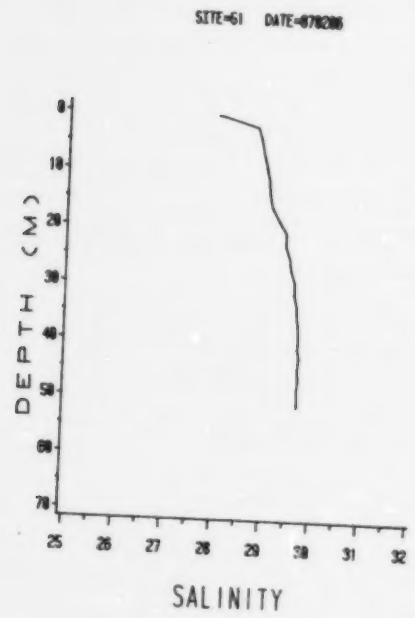
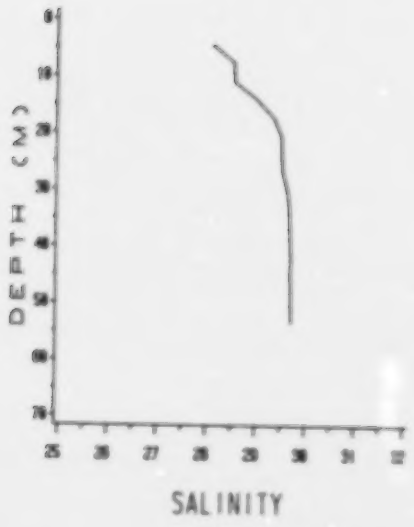

DEPTH (M)
SALINITY

Fig. 7 (cont'd)


DEPTH (M)
SALINITY


SITE=61
DEPTH (M)
SALINITY


DEPTH (M)
SALINITY

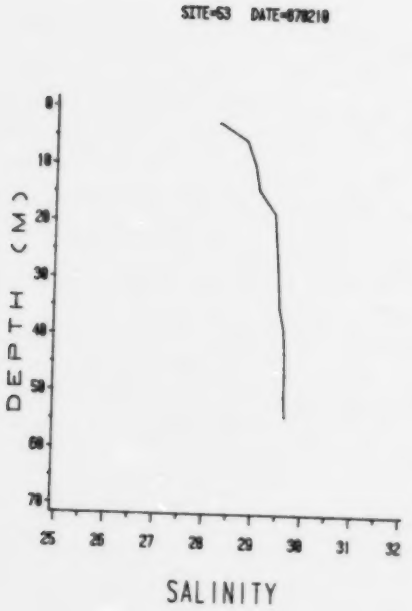

SITE=63
DEPTH (M)
SALINITY

Fig. 7 (cont'd)

Appendix table 1. Summary of set information from the Strait of Georgia lingcod survey in Jan-Feb, 1987. Codes for depth, gear, sun, sea state, tide and current are described in Appendix table 2. REC = record. Species codes: LC lingcod, QB quillback rockfish, CO copper rockfish, YE yelloweye rockfish, CA cabezon, DF spiny dogfish, RS rock sole and SS speckled sanddab.

										EFFORT	Species (No. of fish)											
REC	DATE	SITE	DEPTH	GEAR	SUN	SEA	TIDE	CURR	TIME	(h)	LC	QB	CO	YE	GS	BR	KG	CA	DF	RS	SS	total
1	870115	12	1	comm	2	2	-2	2	1050	0.47	6	1	-	-	-	-	-	-	-	-	-	7
1	870115	12	1	res	2	2	-2	2	1045	0.40	-	4	-	-	-	-	-	-	-	-	-	4
2	870115	12	2	comm	2	2	-1	2	1117	0.47	2	-	-	-	-	-	-	-	-	-	-	2
2	870115	12	2	res	2	2	-1	2	1117	0.43	-	-	-	-	-	-	-	-	-	-	2	2
3	870115	12	3	comm	2	2	-1	2	1155	0.40	-	-	-	3	-	-	-	-	-	-	-	3
3	870115	12	3	res	2	2	-1	2	1155	0.40	-	1	-	-	-	-	-	-	-	-	-	1
4	870115	12	1	comm	2	2	0	2	1237	0.50	4	-	1	-	-	-	-	-	-	-	-	5
4	870115	12	1	res	2	2	0	2	1237	0.37	-	1	2	-	-	-	-	-	-	-	-	3
5	870115	12	2	comm	2	2	+1	2	1305	0.33	4	-	-	-	-	-	-	-	-	-	-	4
5	870115	12	2	res	2	2	+1	2	1305	0.40	-	1	-	-	-	-	-	-	-	-	-	1
6	870115	12	3	comm	2	2	+2	2	1332	0.37	-	-	-	-	-	-	-	-	-	-	-	0
6	870115	12	3	res	2	2	+2	2	1332	0.33	-	-	-	-	-	-	-	-	-	-	-	0
7	870116	27	2	comm	2	2	-4	3	945	0.40	2	-	-	-	-	-	-	-	-	-	-	2
7	870116	27	2	res	2	2	-4	3	945	0.37	-	-	-	-	-	-	1	-	-	-	-	1
8	870116	27	1	comm	2	2	-4	2	1020	0.33	3	-	-	-	-	-	-	-	-	-	-	3
8	870116	27	1	res	2	2	-4	2	1020	0.37	-	1	-	-	-	-	-	-	-	-	-	1
9	870116	27	3	comm	2	2	-3	2	1040	0.37	1	-	-	-	-	-	-	-	2	-	-	3
9	870116	27	3	res	2	2	-3	2	1040	0.30	-	-	-	-	-	-	-	-	-	-	-	0
10	870116	27	1	comm	2	2	-3	1	1115	0.50	2	-	1	-	-	-	-	-	-	-	-	3
10	870116	27	1	res	2	2	-3	1	1115	0.30	-	1	5	-	-	-	-	-	-	-	-	6
11	870116	27	2	comm	2	2	-2	1	1145	0.40	1	1	-	-	-	-	-	-	-	-	-	2
11	870116	27	2	res	2	2	-2	1	1140	0.33	-	-	-	-	-	-	-	-	-	2	-	2
12	870116	27	3	comm	2	2	-1	1	1220	0.33	2	-	-	-	-	-	-	1	-	-	-	3
12	870116	27	3	res	2	2	-1	1	1220	0.27	-	-	-	-	-	-	-	-	-	-	-	0
13	870116	15	1	comm	2	1	-1	1	1245	0.47	1	-	-	-	-	-	-	-	-	-	-	1
13	870116	15	1	res	2	1	-1	1	1245	0.30	-	1	-	-	-	-	1	1	-	-	-	3
14	870116	15	2	comm	2	1	0	2	1314	0.30	-	-	1	-	-	-	-	-	-	-	-	1
14	870117	15	2	res	2	1	0	2	1314	0.33	-	-	1	-	-	-	-	-	-	-	-	1
15	870116	15	3	comm	2	1	+1	1	1335	0.57	-	5	-	-	-	-	-	-	-	-	-	5
15	870116	15	3	res	2	1	+1	1	1335	0.33	-	4	-	-	-	-	-	-	-	-	-	4
16	870119	7	1	comm	2	2	-4	2	1045	0.37	-	1	-	-	-	-	-	-	-	-	-	1
16	870119	7	1	res	2	2	-4	2	1045	0.33	-	1	-	-	-	-	-	-	-	-	-	1
17	870119	7	2	comm	2	2	-3	2	1100	0.50	2	-	-	-	-	-	-	-	-	-	-	2
17	870119	7	2	res	2	2	-3	2	1100	0.33	-	2	-	-	-	-	-	-	-	-	-	2
18	870119	7	3	comm	3	1	-3	2	1130	0.53	-	-	-	-	-	-	-	-	-	-	-	0
18	870119	7	3	res	3	1	-3	2	1130	0.33	-	2	-	-	-	-	-	-	-	-	-	2
19	870119	3	1	comm	3	1	-3	1	1215	0.37	3	1	-	-	-	-	-	-	-	-	-	4
19	870119	3	1	res	3	1	-3	1	1215	0.37	1	1	2	-	-	-	-	-	-	-	-	4
20	870119	3	2	comm	2	1	-2	1	1235	0.40	-	-	-	-	-	-	-	-	1	-	-	1
20	870119	3	2	res	2	1	-2	1	1235	0.33	-	1	-	-	-	-	-	-	-	-	-	1

Appendix table 1 (cont'd)

REC	DATE	SITE	DEPTH	GEAR	SUN	SEA	TIDE	CURR	TIME	EFFORT (h)	Species (No. of fish)										
											NF	LC	QB	CO	YE	GS	BR	KG	CA	DF	RS	SS
21	870119	3	3	comm	2	1	-1	1	1310	0.20	0	-	-	-	-	-	-	-	-	-	-	-
21	870119	3	3	res	2	1	-1	1	1310	0.20	0	-	-	-	-	-	-	-	-	-	-	-
22	870119	3	2	comm	2	1	-1	1	1330	0.33	9	9	-	-	-	-	-	-	-	-	-	-
22	870119	3	2	res	2	1	-1	1	1330	0.47	0	-	-	-	-	-	-	-	-	-	-	-
23	870119	3	1	comm	2	1	-1	1	1350	0.37	9	9	-	-	-	-	-	-	-	-	-	-
23	870119	3	1	res	2	1	-1	1	1350	0.30	3	-	2	1	-	-	-	-	-	-	-	-
24	870119	3	3	comm	2	1	-1	1	1420	0.27	1	-	-	-	-	-	-	-	-	1	-	-
24	870119	3	3	res	2	1	-1	1	1420	0.13	1	-	-	-	-	-	-	-	-	-	1	-
25	870120	30	1	comm	2	1	-4	1	1025	0.37	3	3	-	-	-	-	-	-	-	-	-	-
25	870120	30	1	res	2	1	-4	1	1025	0.37	4	2	-	2	-	-	-	-	-	-	-	-
26	870120	30	2	comm	2	1	-4	2	1050	0.40	1	1	-	-	-	-	-	-	-	-	-	-
26	870120	30	2	res	2	1	-4	2	1050	0.43	1	-	1	-	-	-	-	-	-	-	-	-
27	870120	30	3	comm	2	1	-4	2	1113	0.43	1	1	-	-	-	-	-	-	-	-	-	-
27	870120	30	3	res	2	1	-4	2	1113	0.43	1	-	1	-	-	-	-	-	-	-	-	-
28	870120	30	1	comm	2	1	-3	1	1137	0.43	5	5	-	-	-	-	-	-	-	-	-	-
28	870120	30	1	res	2	1	-3	1	1137	0.40	6	-	4	2	-	-	-	-	-	-	-	-
29	870120	30	2	comm	2	1	-3	2	1200	0.40	0	-	-	-	-	-	-	-	-	-	-	-
29	870120	30	2	res	2	1	-3	2	1200	0.40	0	-	-	-	-	-	-	-	-	-	-	-
30	870120	30	3	comm	2	2	-2	2	1235	0.40	0	-	-	-	-	-	-	-	-	-	-	-
30	870120	30	3	res	2	2	-2	2	1235	0.37	1	-	-	-	-	-	-	-	-	-	-	1
31	870120	13	1	comm	2	1	-1	2	1325	0.53	5	3	1	-	1	-	-	-	-	-	-	-
31	870120	13	1	res	2	1	-1	2	1325	0.43	4	1	2	1	-	-	-	-	-	-	-	-
32	870120	13	2	comm	2	1	-1	2	1355	0.33	1	-	-	-	-	-	-	-	-	1	-	-
32	870120	13	2	res	2	1	-1	2	1355	0.33	1	-	-	-	-	-	-	-	-	1	-	-
33	870120	13	3	comm	2	1	-1	2	1405	0.37	1	-	-	1	-	-	-	-	-	-	-	-
33	870120	13	3	res	2	1	-1	2	1405	0.47	2	-	1	1	-	-	-	-	-	-	-	-
34	870121	3	1	comm	2	1	-4	1	1120	0.57	4	4	-	-	-	-	-	-	-	-	-	-
34	870121	3	1	res	2	1	-4	1	1120	0.37	7	-	2	5	-	-	-	-	-	-	-	-
35	870121	3	2	comm	1	1	-3	2	1150	0.43	1	1	-	-	-	-	-	-	-	-	-	-
35	870121	3	2	res	1	1	-3	2	1150	0.37	0	-	-	-	-	-	-	-	-	-	-	-
36	870121	3	3	comm	1	1	-3	1	1220	0.10	1	-	-	-	-	-	-	-	-	1	-	-
36	870121	3	3	res	1	1	-3	1	1220	0.10	3	-	1	-	-	-	-	-	-	2	-	-
37	870121	3	1	comm	1	1	-3	1	1245	0.37	10	10	-	-	-	-	-	-	-	-	-	-
37	870121	3	1	res	1	1	-3	1	1245	0.40	4	-	2	2	-	-	-	-	-	-	-	-
38	870121	3	2	comm	1	1	-2	1	1320	0.30	7	7	-	-	-	-	-	-	-	-	-	-
38	870121	3	2	res	1	1	-2	1	1320	0.43	0	-	-	-	-	-	-	-	-	-	-	-
39	870121	3	3	comm	1	1	-1	1	1345	0.27	0	-	-	-	-	-	-	-	-	-	-	-
39	870121	3	3	res	1	1	-1	1	1345	0.37	3	-	-	-	-	-	-	-	-	2	-	1
40	870121	3	3	comm	1	1	-1	1	1425	0.33	0	-	-	-	-	-	-	-	-	-	-	-
40	870121	3	3	res	1	1	-1	1	1425	0.30	0	-	-	-	-	-	-	-	-	-	-	-
41	870121	7	1	comm	1	1	-1	1	1500	0.47	2	2	-	-	-	-	-	-	-	-	-	-
41	870121	7	1	res	1	1	-1	1	1500	0.43	0	-	-	-	-	-	-	-	-	-	-	-
42	870121	7	2	comm	2	1	-1	2	1520	0.37	5	4	-	-	-	-	-	-	-	1	-	-
42	870121	7	2	res	2	1	-1	2	1520	0.33	2	-	2	-	-	-	-	-	-	-	-	-

Appendix table 1 (cont'd)

REC	DATE	SITE	DEPTH	GEAR	SUN	SEA	TIDE	CURR	TIME	EFFORT (h)	Species (No. of fish)											
											NF	LC	QB	CO	YE	GS	BR	KG	CA	DF	RS	SS
43	870121	7	3	comm	2	1	-1	1	1545	0.27	2	-	-	-	-	-	-	-	-	2	-	-
43	870121	7	3	res	2	1	-1	1	1545	0.33	0	-	-	-	-	-	-	-	-	-	-	-
44	870122	12	1	comm	2	1	-5	1	1020	0.37	9	9	-	-	-	-	-	-	-	-	-	-
44	870122	12	1	res	2	1	-5	1	1020	0.40	3	1	2	-	-	-	-	-	-	-	-	-
45	870122	12	2	comm	3	1	-5	1	1045	0.37	4	4	-	-	-	-	-	-	-	-	-	-
45	870122	12	2	res	3	1	-5	1	1045	0.37	2	-	1	-	1	-	-	-	-	-	-	-
46	870122	12	3	comm	3	1	-4	1	1110	0.43	0	-	-	-	-	-	-	-	-	-	-	-
46	870122	12	3	res	3	1	-4	1	1110	0.37	2	-	2	-	-	-	-	-	-	-	-	-
47	870122	12	1	comm	3	1	-4	1	1140	0.40	2	-	2	-	-	-	-	-	-	-	-	-
47	870122	12	1	res	3	1	-4	1	1140	0.33	5	1	1	3	-	-	-	-	-	-	-	-
48	870122	12	2	comm	3	1	-3	1	1210	0.37	1	-	1	-	-	-	-	-	-	-	-	-
48	870122	12	2	res	3	1	-3	1	1210	0.40	0	-	-	-	-	-	-	-	-	-	-	-
49	870122	12	3	comm	3	1	-3	1	1230	0.43	1	-	-	-	-	-	-	-	-	1	-	-
49	870122	12	3	res	3	1	-3	1	1230	0.43	0	-	-	-	-	-	-	-	-	-	-	-
50	870122	13	1	comm	3	1	-2	1	1317	0.37	10	10	-	-	-	-	-	-	-	-	-	-
50	870122	13	1	res	3	1	-2	1	1317	0.37	1	-	1	-	-	-	-	-	-	-	-	-
51	870122	13	2	comm	2	1	-2	1	1340	0.50	2	2	-	-	-	-	-	-	-	-	-	-
51	870122	13	2	res	2	1	-2	1	1340	0.33	2	1	1	-	-	-	-	-	-	-	-	-
52	870122	13	3	comm	2	1	-1	1	1405	0.43	0	-	-	-	-	-	-	-	-	-	-	-
52	870122	13	3	res	2	1	-1	1	1405	0.37	1	-	-	-	-	-	-	-	-	-	-	1
53	870123	19	1	comm	4	2	-4	1	1105	0.47	0	-	-	-	-	-	-	-	-	-	-	-
53	870123	19	1	res	4	2	-4	1	1105	0.37	3	1	-	2	-	-	-	-	-	-	-	-
54	870123	19	2	comm	4	2	-4	2	1125	0.37	3	3	-	-	-	-	-	-	-	-	-	-
54	870123	19	2	res	4	2	-4	2	1125	0.40	1	-	-	1	-	-	-	-	-	-	-	-
55	870123	19	3	comm	2	2	-4	2	1150	0.43	0	-	-	-	-	-	-	-	-	-	-	-
55	870123	19	3	res	2	2	-4	1	1150	0.40	0	-	-	-	-	-	-	-	-	-	-	-
56	870123	19	1	comm	2	2	-3	2	1210	0.40	2	2	-	-	-	-	-	-	-	-	-	-
56	870123	19	1	res	2	2	-3	2	1210	0.40	1	-	-	1	-	-	-	-	-	-	-	-
57	870123	19	3	comm	2	3	-3	2	1230	0.37	2	2	-	-	-	-	-	-	-	-	-	-
57	870123	19	3	res	2	3	-3	2	1230	0.37	0	-	-	-	-	-	-	-	-	-	-	-
58	870123	19	3	comm	2	3	-3	3	1255	0.33	0	-	-	-	-	-	-	-	-	-	-	-
58	870123	19	3	res	2	3	-3	3	1255	0.33	0	-	-	-	-	-	-	-	-	-	-	-
59	870129	53	2	comm	4	4	-1	3	930	0.60	1	1	-	-	-	-	-	-	-	-	-	-
59	870129	53	2	res	4	4	-1	3	930	0.37	5	-	3	2	-	-	-	-	-	-	-	-
60	870129	53	1	comm	2	4	-1	3	1007	0.37	0	-	-	-	-	-	-	-	-	-	-	-
60	870129	53	1	res	2	4	-1	3	1007	0.37	2	-	-	1	-	-	1	-	-	-	-	-
61	870129	53	3	comm	2	4	0	3	1030	0.50	0	-	-	-	-	-	-	-	-	-	-	-
61	870129	53	3	res	2	4	0	3	1030	0.30	2	-	-	1	-	1	-	-	-	-	-	-
62	870129	53	1	comm	2	4	+1	3	1105	0.40	1	1	-	-	-	-	-	-	-	-	-	-
62	870129	53	1	res	2	4	+1	3	1105	0.37	2	-	2	-	-	-	-	-	-	-	-	-
63	870129	53	2	comm	2	4	+1	3	1130	0.40	0	-	-	-	-	-	-	-	-	-	-	-
63	870129	53	2	res	2	4	+1	3	1130	0.37	1	-	1	-	-	-	-	-	-	-	-	-
64	870203	19	1	comm	2	1	-4	2	1015	0.33	0	-	-	-	-	-	-	-	-	-	-	-
64	870203	19	1	res	2	1	-4	2	1015	0.40	3	-	-	3	-	-	-	-	-	-	-	-

Appendix table 1 (cont'd)

REC	DATE	SITE	DEPTH	GEAR	SUN	SEA	TIDE	CURR	TIME	EFFORT (h)	Species (No. of fish)										
											NF	LC	QB	CO	YE	GS	BR	KG	CA	DF	RS	SS
65	870203	19	2	comm	2	2	-3	2	1037	0.47	0	-	-	-	-	-	-	-	-	-	-
65	870203	19	2	res	2	2	-3	2	1037	0.37	2	-	-	-	-	-	-	1	-	-	-
66	870203	19	3	comm	2	2	-3	3	1103	0.47	1	1	-	-	-	-	-	-	-	-	-
66	870203	19	3	res	2	2	-3	3	1103	0.37	2	-	1	1	-	-	-	-	-	-	-
67	870203	19	1	comm	2	2	-3	2	1130	0.40	2	2	-	-	-	-	-	-	-	-	-
67	870203	19	1	res	2	2	-3	2	1030	0.40	1	-	-	1	-	-	-	-	-	-	-
68	870203	19	2	comm	2	2	-2	2	1150	0.43	0	-	-	-	-	-	-	-	-	-	-
68	870203	19	2	res	2	2	-2	2	1150	0.40	0	-	-	-	-	-	-	-	-	-	-
69	870203	19	3	comm	2	2	-2	3	1210	0.50	0	-	-	-	-	-	-	-	-	-	-
69	870203	19	3	res	2	2	-2	3	1210	0.37	0	-	-	-	-	-	-	-	-	-	-
70	870203	15	1	comm	2	2	-1	3	1305	0.67	0	-	-	-	-	-	-	-	-	-	-
70	870203	15	1	res	2	2	-1	3	1305	0.40	5	-	2	2	-	-	-	-	1	-	-
71	870203	15	2	comm	2	2	-1	3	1340	0.27	2	2	-	-	-	-	-	-	-	-	-
71	870203	15	2	res	2	2	-1	3	1340	0.17	4	-	3	-	-	-	-	1	-	-	-
72	870203	15	2	comm	2	2	-1	2	1400	0.47	4	3	-	-	-	-	-	-	1	-	-
72	870203	15	2	res	2	2	-1	2	1400	0.40	2	-	-	-	-	-	-	1	1	-	-
73	870203	15	3	comm	2	2	-1	2	1430	0.50	1	-	1	-	-	-	-	-	-	-	-
73	870203	15	3	res	2	2	-1	2	1430	0.37	0	-	-	-	-	-	-	-	-	-	-
74	870205	30	1	comm	2	6	-4	2	1045	0.37	3	3	-	-	-	-	-	-	-	-	-
74	870205	30	1	res	2	6	-4	2	1045	0.47	0	-	-	-	-	-	-	-	-	-	-
75	870205	30	2	comm	2	6	-4	2	1105	0.33	2	2	-	-	-	-	-	-	-	-	-
75	870205	30	2	res	2	6	-4	2	1105	0.37	1	-	-	-	1	-	-	-	-	-	-
76	870205	30	3	comm	2	6	-4	2	1127	0.37	4	3	-	-	1	-	-	-	-	-	-
76	870205	30	3	res	2	6	-4	2	1130	0.40	1	-	1	-	-	-	-	-	-	-	-
77	870205	30	1	comm	2	6	-3	2	1153	0.37	7	7	-	-	-	-	-	-	-	-	-
77	870205	30	1	res	2	6	-3	2	1153	0.37	2	-	-	2	-	-	-	-	-	-	-
78	870205	30	2	comm	2	6	-3	2	1217	0.43	1	1	-	-	-	-	-	-	-	-	-
78	870205	30	2	res	2	6	-3	2	1217	0.37	0	-	-	-	-	-	-	-	-	-	-
79	870203	30	3	comm	2	6	-2	2	1300	0.40	2	2	-	-	-	-	-	-	-	-	-
79	870205	30	3	res	2	6	-2	2	1300	0.37	0	-	-	-	-	-	-	-	-	-	-
80	870205	13	1	comm	2	6	-2	2	1335	0.40	5	4	-	1	-	-	-	-	-	-	-
80	870205	13	1	res	2	6	-2	2	1335	0.37	1	-	-	-	-	-	-	-	-	-	-
81	870205	13	2	comm	2	6	-2	2	1355	0.37	0	-	-	-	-	-	-	-	-	-	-
81	870205	13	2	res	2	6	-2	2	1355	0.37	0	-	-	-	-	-	-	-	-	-	-
82	870205	13	3	comm	2	6	-2	2	1420	0.37	1	-	-	-	-	-	-	-	-	1	-
82	870205	13	3	res	2	6	-2	2	1420	0.33	0	-	-	-	-	-	-	-	-	-	-
83	870205	27	1	comm	2	2	-2	1	1450	0.43	1	1	-	-	-	-	-	-	-	-	-
83	870205	27	1	res	2	2	-2	1	1450	0.33	3	-	3	-	-	-	-	-	-	-	-
84	870205	27	1	comm	3	2	-1	1	1515	0.47	0	-	-	-	-	-	-	-	-	-	-
84	870205	27	1	res	3	2	-1	1	1315	0.33	1	-	-	-	-	-	-	1	-	-	-
85	870205	27	3	comm	3	2	-1	1	1535	0.43	0	-	-	-	-	-	-	-	-	-	-
85	870205	30	3	res	3	2	-1	1	1535	0.40	1	-	-	-	-	-	-	1	-	-	-
86	870206	51	1	comm	1	3	-4	2	1100	0.50	4	3	-	1	-	-	-	-	-	-	-
86	870206	51	1	res	1	3	-4	2	1100	0.37	3	-	-	3	-	-	-	-	-	-	-

Appendix table 1 (cont'd)

REC	DATE	SITE	DEPTH	GEAR	SUN	SEA	TIDE	CURR	TIME	EFFORT (h)	Species (No. of fish)											
											NF	LC	QB	CO	YE	GS	BR	KG	CA	DF	RS	SS
87	870206	51	2	comm	1	3	-4	2	1130	0.47	2	2	-	-	-	-	-	-	-	-	-	-
87	870206	51	2	res	1	3	-4	2	1130	0.43	2	-	2	-	-	-	-	-	-	-	-	-
88	870206	51	3	comm	1	3	-4	2	1155	0.50	0	-	-	-	-	-	-	-	-	-	-	-
88	870206	51	3	res	1	3	-4	2	1155	0.40	2	-	2	-	-	-	-	-	-	-	-	-
89	870206	51	1	comm	1	3	-3	2	1235	0.43	0	-	-	-	-	-	-	-	-	-	-	-
89	870206	51	1	res	1	3	-3	2	1235	0.37	1	1	-	-	-	-	-	-	-	-	-	-
90	870206	51	2	comm	1	3	-3	2	1300	0.47	0	-	-	-	-	-	-	-	-	-	-	-
90	870206	51	2	res	1	3	-3	2	1300	0.43	1	-	1	-	-	-	-	-	-	-	-	-
91	870206	51	3	comm	1	3	-2	2	1325	0.40	0	-	-	-	-	-	-	-	-	-	-	-
91	870206	51	3	res	1	3	-2	2	1325	0.40	0	-	-	-	-	-	-	-	-	-	-	-
92	870206	127	1	comm	1	2	-3	2	1440	0.40	0	-	-	-	-	-	-	-	-	-	-	-
92	870206	127	1	res	1	2	-3	2	1440	0.33	3	-	2	-	-	-	-	1	-	-	-	-
93	870206	127	2	comm	1	2	-3	2	1500	0.37	1	1	-	-	-	-	-	-	-	-	-	-
93	870206	127	2	res	1	2	-3	2	1500	0.40	1	-	1	-	-	-	-	-	-	-	-	-
94	870206	127	3	comm	1	2	-2	2	1515	0.43	2	1	-	-	-	-	-	-	-	1	-	-
94	870206	127	3	res	1	2	-2	2	1520	0.40	0	-	-	-	-	-	-	-	-	-	-	-
95	870208	7	1	comm	2	1	+6	1	1120	0.50	8	8	-	-	-	-	-	-	-	-	-	-
95	870208	7	1	res	2	1	+6	1	1120	0.43	7	1	3	3	-	-	-	-	-	-	-	-
96	870208	7	2	comm	2	1	+6	1	1145	0.37	1	1	-	-	-	-	-	-	-	-	-	-
96	870208	7	2	res	2	1	+6	1	1145	0.37	0	-	-	-	-	-	-	-	-	-	-	-
97	870208	7	3	comm	2	1	-5	1	1210	0.07	1	-	-	-	-	-	-	-	-	1	-	-
97	870208	7	3	res	2	1	-5	1	1210	0.07	2	-	-	-	-	-	-	-	-	2	-	-
98	870208	7	3	comm	2	1	-5	1	1230	0.03	1	-	-	-	-	-	-	-	-	1	-	-
98	870208	7	3	res	2	1	-5	1	1230	0.03	1	-	-	-	-	-	-	-	-	1	-	-
99	870208	7	1	comm	2	1	-5	1	1255	0.40	3	3	-	-	-	-	-	-	-	-	-	-
99	870208	7	1	res	2	1	-5	1	1255	0.37	1	-	-	1	-	-	-	-	-	-	-	-
100	870208	7	2	comm	2	1	-5	1	1320	0.40	0	-	-	-	-	-	-	-	-	-	-	-
100	870208	7	2	res	2	1	-5	1	1320	0.40	0	-	-	-	-	-	-	-	-	-	-	-
101	870208	7	3	comm	2	1	-4	1	1340	0.43	7	2	1	-	1	-	-	-	-	3	-	-
101	870208	7	3	res	2	1	-4	1	1340	0.33	6	-	4	-	1	-	-	-	-	1	-	-
102	870208	13	1	comm	2	1	-4	1	1435	0.37	0	-	-	-	-	-	-	-	-	-	-	-
102	870208	13	1	res	2	1	-4	1	1435	0.37	0	-	-	-	-	-	-	-	-	-	-	-
103	870208	13	2	comm	2	1	-3	1	1450	0.67	0	-	-	-	-	-	-	-	-	-	-	-
103	870208	13	2	res	2	1	-3	1	1450	0.47	5	-	-	-	-	-	-	-	-	-	-	5
104	870208	13	3	comm	2	1	-3	2	1520	0.43	0	-	-	-	-	-	-	-	-	-	-	-
104	870208	13	3	res	2	1	-3	2	1520	0.27	2	-	1	-	-	1	-	-	-	-	-	-
105	870209	15	1	comm	2	6	-1	1	930	0.43	6	4	2	-	-	-	-	-	-	-	-	-
105	870209	15	1	res	2	6	-1	1	930	0.43	5	-	5	-	-	-	-	-	-	-	-	-
106	870209	15	2	comm	2	6	0	1	955	0.40	1	1	-	-	-	-	-	-	-	-	-	-
106	870209	15	2	res	2	6	0	1	1000	0.43	1	-	-	-	-	-	-	1	-	-	-	-
107	870209	15	3	comm	2	1	0	2	1020	0.17	1	-	-	-	-	-	-	-	1	-	-	-
107	870209	15	3	res	2	1	0	2	1025	0.17	1	-	1	-	-	-	-	-	-	-	-	-
108	870209	15	2	comm	2	1	0	2	1040	0.30	0	-	-	-	-	-	-	-	-	-	-	-
108	870209	15	2	res	2	1	0	2	1040	0.37	0	-	-	-	-	-	-	-	-	-	-	-

Appendix table 1 (cont'd)

REC	DATE	SITE	DEPTH	GEAR	SUN	SEA	TIDE	CURR	TIME	EFFORT (h)	Species (No. of fish) NF	LC	QB	CO	YE	GS	BR	KG	CA	DF	RS	SS
109	870209	27	1	comm	2	1	00	2	1057	0.50	1	1	-	-	-	-	-	-	-	-	-	-
109	870209	27	1	res	2	1	00	2	1057	0.43	2	-	1	1	-	-	-	-	-	-	-	-
110	870209	15	2	comm	2	1	00	2	1125	0.43	0	-	-	-	-	-	-	-	-	-	-	-
110	870209	15	2	res	2	1	00	2	1125	0.40	0	-	-	-	-	-	-	-	-	-	-	-
111	870209	15	1	comm	2	1	00	2	1145	0.50	1	-	-	-	-	-	-	-	1	-	-	-
111	870209	15	1	res	2	1	00	2	1145	0.33	7	-	-	4	-	-	-	2	1	-	-	-
112	870209	15	3	comm	2	1	00	2	1230	0.47	2	2	-	-	-	-	-	-	-	-	-	-
112	870209	15	3	res	2	1	00	2	1230	0.37	1	-	1	-	-	-	-	-	-	-	-	-
113	870209	27	1	comm	2	1	-5	2	1310	0.47	2	2	-	-	-	-	-	-	-	-	-	-
113	870209	27	1	res	2	1	-5	2	1310	0.33	3	-	2	1	-	-	-	-	-	-	-	-
114	870209	27	2	comm	2	1	-5	2	1340	0.40	1	-	-	-	-	-	-	-	-	1	-	-
114	870209	27	2	res	2	1	-5	2	1340	0.40	0	-	-	-	-	-	-	-	-	-	-	-
115	870209	27	3	comm	2	1	-5	2	1355	0.37	0	-	-	-	-	-	-	-	-	-	-	-
115	870209	27	3	res	2	1	-5	2	1355	0.40	1	-	-	-	-	-	-	-	-	1	-	-
116	870210	53	1	comm	2	1	-1	1	1000	0.60	2	1	-	1	-	-	-	-	-	-	-	-
116	870210	53	1	res	2	1	-1	1	1000	0.40	6	-	4	2	-	-	-	-	-	-	-	-
117	870210	53	2	comm	2	1	0	1	1025	0.40	5	5	-	-	-	-	-	-	-	-	-	-
117	870210	53	2	res	2	1	0	1	1025	0.37	1	1	-	-	-	-	-	-	-	-	-	-
118	870210	53	3	comm	2	1	0	1	1055	0.43	0	-	-	-	-	-	-	-	-	-	-	-
118	870210	53	3	res	2	1	0	1	1055	0.37	2	-	2	-	-	-	-	-	-	-	-	-
119	870210	53	1	comm	2	1	0	1	1120	0.43	4	4	-	-	-	-	-	-	-	-	-	-
119	870210	53	1	res	2	1	0	1	1120	0.50	0	-	-	-	-	-	-	-	-	-	-	-
120	870210	53	2	comm	2	1	0	1	1145	0.40	1	1	-	-	-	-	-	-	-	-	-	-
120	870210	53	2	res	2	1	0	1	1145	0.33	1	-	-	-	-	-	-	-	-	-	-	-
121	870210	53	3	comm	2	1	0	1	1205	0.53	0	-	-	-	-	-	-	-	-	-	-	-
121	870210	53	3	res	2	1	0	1	1205	0.33	1	-	-	-	-	-	-	-	-	-	-	-

Appendix table 2. Codes used to describe depth, gear, sun, sea state, tide and current during lingcod survey.

Depth	1	5-27 m (3-15 fa)
	2	28-46 m (16-25 fm)
	3	47-55 m (26-30 fm)
Gear	comm	standard commercial lingcod handline method with live 15-20-cm bait herring and double Mustad #93664 size-6 hooks and 23-kg-test monofilament line and steel leader.
	res	standard research hook and line method using 12-cm (5-inch) frozen bait herring and two single Mustad #92553 size 3/0 hooks and 9-kg-test monofilament line with 7-kg-test leader.
Sun	1	bright
	2	dull or overcast
	3	variable
	4	rain
Sea state	1	calm
	2	rippled
	3	0.5 m chop
	4	1.0 m chop
	5	1.5 m chop
	6	swell
Tide		code as hours from low slack on a scale of -5 (one hour after high slack) to 0 (low slack) to +6 (high slack)
Current	1	nil
	2	weak
	3	moderate
	4	strong

Appendix table 3. Length, weight, sex and maturity for each fish caught during the lingcod survey, Jan-Feb, 1987. Data are sorted by species, sex and length. Maturity codes are described in Appendix table 4. A fish number indicates that otoliths (rockfish) or fin rays (lingcod) were collected.

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH No.
Copper Rockfish							
870210	53	16	M	250	323	3	10236
870210	53	49	M	254	310	7	10225
870208	7	18	M	262	364	3	10256
870123	19	13	M	266	343	3	10229
870117	15	40	M	273	390	7	10211
870208	7	18	M	275	366	1	10257
870209	15	18	M	280	436	3	10244
870121	3	11	M	300	528	3	10245
870206	51	13	M	306	496	3	10263
870123	19	9	M	307	590	3	10228
870210	53	16	M	307	474	3	10237
870122	12	11	M	313	538	3	10222
870209	15	18	M	320	604	3	10242
870121	3	11	M	321	614	3	10249
870120	30	17	M	323	595	6	10219
870129	53	13	M	326	669	3	10259
870116	27	15	M	330	550	7	10207
870116	27	15	M	330	580	7	10208
870122	12	11	M	330	644	3	10223
870120	30	7	M	331	545	1	10221
870203	19	7	M	333	650	3	10310
870119	3	18	M	337	630	7	10212
870120	13	49	M	338	650	6	10216
870121	3	22	M	338	722	3	10251
870123	19	9	M	340	747	3	10227
870203	19	7	M	341	611	3	10311
870203	15	9	M	342	790	4	10307
870209	15	18	M	351	852	3	10241
870116	27	15	M	352	750	7	10206
870209	27	13	M	358	807	7	10238
870121	3	22	M	360	911	3	10250
870119	3	7	M	366	850	7	10214
870116	27	15	M	370	925	7	10205
870120	30	17	M	374	880	6	10218
870210	53	16	M	375	922	4	10230
870203	19	7	F	233	207	1	10313
870203	19	49	F	237	227	1	10309
870209	15	18	F	264	330	4	10243
870129	53	29	F	278	369	2	10254
870115	12	15	F	283	375	7	10202
870203	19	7	F	285	440	4	10312
870115	12	15	F	305	500	2	10203

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Copper Rockfish (cont'd)							
870208	7	18	F	312	526	4	10258
870203	15	9	F	314	555	4	10306
870205	30	9	F	318	647	4	10232
870205	13	15	F	319	646	2	10231
870129	53	29	F	319	665	3	10253
870205	30	9	F	320	574	7	10233
870121	3	11	F	320	570	4	10248
870116	15	40	F	324	580	3	10210
870121	3	22	F	326	777	4	10252
870116	27	15	F	328	640	3	10209
870122	12	11	F	335	696	4	10224
870120	13	15	F	336	710	1	10215
870209	27	15	F	336	656	3	10235
870123	19	33	F	338	646	4	10226
870120	30	7	F	340	510	3	10220
870121	3	11	F	340	790	4	10247
870208	7	18	F	341	648	4	10255
870206	51	13	F	343	640	4	10264
870203	19	9	F	344	959	4	10308
870116	27	15	F	347	750	3	10204
870119	3	18	F	348	780	3	10213
870206	51	13	F	352	878	4	10261
870115	12	15	F	357	735	3	10201
870121	3	11	F	361	764	7	10246
870206	51	13	F	378	048	4	10262
870205	13	15	F	402	478	4	10234
870120	13	49	F	428	490	3	10217
870129	53	57	F	465	014	4	10260
Greenstripe Rockfish							
870208	13	57	F	285	380	4	
870129	53	57	F	290	383	4	
Puget Sound Rockfish							
870203	19	31		197	80		
Quillback Rockfish							
870129	53	24	M		539	3	10092
870122	12	11	M	217	186	1	10053
870205	27	24	M	224	259	1	10059
870209	15	59	M	274	419	1	10079
870120	13	15	M	278	390	1	10033
870209	27	13	M	286	415	7	
870206	27	20	M	295	573	3	10104
870119	3	18	M	298	480	7	10029

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Quillback Rockfish (cont'd)							
870205	13	15	M	301	501	3	10066
870203	15	9	M	302	547	4	10046
870208	7	53	M	303	652	3	10089
870208	7	53	M	310	630	1	10086
870210	53	16	M	318	607	3	10069
870121	3	22	M	320	624	3	10085
870210	53	49	M	320	603	3	10064
870203	15	33	M	321	713	4	10045
870122	12	11	M	321	664	3	10052
870209	27	15	M	322	683	3	10067
870210	53	16	M	323	659	3	10070
870203	15	33	M	325	713	3	10044
870122	12	59	M	325	940	3	10050
870122	12	59	M	326	683	3	10051
870116	15	51	M	328	650	1	10010
870121	7	37	M	333	760	3	10082
870120	30	49	M	335	655	7	10041
870120	13	15	M	335	685	6	10034
870129	53	29	M	335	759	3	10094
870116	27	18	M	337	740	7	10015
870120	13	49	M	337	670	6	10035
870122	13	37	M	340	802	3	10056
870206	51	37	M	340	730	3	10107
870121	7	37	M	340	776	3	10081
870116	15	51	M	344	800	7	10011
870203	19	49	M	345	795	4	
870115	12	22	M	347	695	7	10004
870120	30	17	M	348	765	6	10038
870120	30	17	M	348	740	1	10040
870203	15	9	M	350	825	4	10047
870208	13	57	M	350	809	7	10093
870209	15	18	M	357	938	3	10074
870210	53	16	M	358	870	7	
870129	53	24	M	360	1037	3	10091
870210	53	53	M	366	1002	3	10063
870119	7	33	M	370	925	7	10024
870119	7	59	M	373	950	7	10027
870120	30	33	M	377	1035	6	10042
870122	12	11	M	701	3440	8	301
870206	51	46	F		856	4	10102
870210	53	49	F	229	221	1	10065
870210	53	38	F	230	244	1	10061
870209	15	18	F	241	303	2	10075
870119	3	18	F	270	960	2	10032
870121	3	11	F	272	371	4	10084

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Quillback Rockfish (cont'd)							
870116	15	11	F	281	460	2	10013
870205	27	24	F	288	457	2	10057
870115	12	15	F	289	540	3	10006
870116	15	51	F	290	500	1	10012
870116	27	15	F	294	500	3	10014
870121	3	11	F	300	496	4	10083
870208	7	18	F	307	613	4	10098
870209	15	18	F	309	635	4	10077
870116	15	51	F	312	550	1	10009
870208	7	53	F	312	509	2	10087
870129	53	29	F	314	691	4	10096
870205	27	24	F	317	702	4	10058
870119	3	7	F	319	750	3	10030
870210	53	16	F	321	767	4	10071
870116	15	51	F	322	620	3	10017
870122	12	11	F	322	666	4	10054
870206	51	46	F	322	616	4	10101
870209	15	18	F	325	834	4	10072
870203	15	33	F	328	863	4	10043
870120	30	17	F	329	685	2	10037
870119	3	35	F	330	710	3	10023
870208	7	18	F	332	713	4	10097
870209	15	18	F	335	896	4	10073
870208	7	18	F	335	746	4	10099
870129	53	29	F	336	771	4	10095
870205	30	48	F	337	785	4	10060
870120	30	17	F	343	730	2	10039
870116	15	51	F	346	340	3	10020
870119	7	18	F	346	820	3	10022
870122	13	15	F	350	849	4	
870209	15	55	F	351	1147	4	10080
870203	15	55	F	352	1040	4	
870119	3	7	F	353	930	3	10028
870209	15	18	F	353	1061	4	10076
870115	12	29	F	354	890	3	10001
870206	51	37	F	354	789	4	10106
870206	51	37	F	354	901	4	10108
870115	12	22	F	357	860	3	10005
870115	12	22	F	358	890	3	10002
870206	27	20	F	358	973	4	10103
870120	13	15	F	359	860	2	10036
870116	15	51	F	360	450	3	10019
870119	7	59	F	360	830	3	10026
870119	7	18	F	361	990	3	10031
870119	7	33	F	361	970	3	10025

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Quillback Rockfish (cont'd)							
870129	53	42	F	362	1036	4	10100
870206	27	31	F	367	1083	4	10105
870115	12	22	F	370	960	3	10008
870122	12	37	F	370	1081	4	10055
870121	3	55	F	370	1219	4	10078
870115	12	22	F	371	945	3	10003
870122	12	33	F	372	1065	4	10049
870116	15	51	F	375	990	3	10021
870208	7	53	F	379	1280	4	10088
870116	15	51	F	381	1220	3	10018
870208	7	53	F	385	1390	4	10090
870210	53	53	F	388	1174	4	10062
870116	27	37	F	404	1340	3	10016
870115	12	49	F	411	1260	2	10007
870209	27	15	F	450	946	4	10068
870122	12	11	F	746	4175	8	300
Yelloweye Rockfish							
870205	30	37	M	244	247	1	10317
870208	7	53	M	367	908	1	10316
870120	13	15	M	425	1385	1	10304
870122	12	33	M	430	1534	7	10315
870115	12	49	M	459	1750	7	10301
870115	12	49	F	414	1340	2	10302
870208	7	53	F	470	2331	4	10318
870205	30	48	F	525	2775	2	10304
870115	12	49	F	540	3020	3	10303
Kelp Greenling							
870206	27	20		335			
870116	15	11		423			
870205	27	26	M	395			
870203	15	33	F				
870203	19	31	F				
870205	30	48	F	318			
870209	15	37	F	335			
870209	15	18	F	378			
870116	27	33	F	393			
870203	15	35	F	415			
870209	15	18	F	430			
Lingcod							
870208	7	18	M	457	780	7	366
870206	51	18	M	494	1225	7	352
870206	51	37	M	505	1300	8	348

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Lingcod (cont'd)							
870122	12	11	M	517	1420	7	304
870208	7	18	M	525	1260	7	363
870210	53	16	M	529	1460	7	379
870122	12	11	M	530	1450	8	303
870122	13	37	M	531	1290	2	310
870206	51	13	M	531	1450	7	350
870115	12	15	M	535	1360	8	207
870121	7	9	M	536	1420	8	277
870122	12	11	M	538	1630	8	294
870129	53	29	M	540	1510	8	320
870119	3	18	M	541	1410	8	228
870120	30	7	M	544	1750	8	247
870123	19	9	M	550	1620	7	318
870203	19	9	M	552	1690	8	322
870119	3	7	M	554	1490	8	236
870210	53	24	M	555	1730	7	387
870115	12	29	M	560	1550	8	213
870208	7	18	M	560	1640	8	359
870208	7	18	M	560	1630	8	364
870115	12	22	M	561	1725	7	201
870206	51	37	M	561	1650	8	349
870119	3	18	M	564	1660	8	229
870206	51	13	M	564	1675	7	351
870121	3	37	M	565	1640	8	281
870115	12	22	M	567	1780	8	202
870115	12	22	M	571	1550	7	200
870209	15	18	M	572	1960	7	373
870121	7	37	M	574	1800	7	285
870209	15	18	M	576	1860	7	374
870122	12	11	M	578	2160	7	305
870119	7	33	M	581	1890	7	226
870208	7	18	M	586	1760	8	358
870203	15	35	M	594	2025	2	328
870205	30	9	M	594	1950	8	344
870210	53	24	M	595	2080	7	385
870120	30	7	M	598	2000	8	253
870116	27	18	M	600	2010	8	218
870203	19	9	M	600	2140	8	323
870122	13	15	M	609	2190	8	293
870121	3	22	M	616	2390	7	266
870121	7	37	M	616	2125	7	283
870119	3	7	M	618	2240	8	235
870205	30	35	M	619	2700	7	329
870129	53	24	M	632	2550	8	319
870120	30	7	M	635	2460	8	254

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Lingcod (cont'd)							
870122	13	37	M	637	2330	8	309
870205	13	15	M	640	2490	8	341
870119	3	7	M	648	1550	8	233
870209	27	15	M	649	2720	8	370
870119	3	7	M	669	3030	8	237
870208	7	18	M	709	3550	8	355
870115	12	22	M	721	3800	8	205
870205	30	9	M	750	4220	8	343
870116	27	15	F	470	930	2	220
870119	3	18	F	475	910	2	238
870122	12	11	F	500	1210	2	302
870209	15	18	F	505	1315	2	371
870121	3	37	F	510	1175	2	270
870120	13	15	F	516	1280	1	259
870122	12	11	F	527	1200	2	295
870209	15	37	F	540	1440	2	367
870116	27	37	F	548	1540	2	214
870116	27	18	F	550	1550	2	219
870122	12	11	F	556	1590	2	308
870210	53	37	F	564	1575	2	381
870121	3	22	F	569	1650	2	263
870115	12	22	F	571	1710	2	204
870210	53	24	F	577	1675	2	388
870119	3	37	F	578	1950	2	246
870205	13	15	F	582	1940	2	340
870122	12	33	F	585	1820	2	298
870210	53	37	F	589	1910	2	377
870122	12	33	F	590	2100	2	299
870119	3	37	F	596	1790	2	240
870121	7	37	F	596	1930	2	282
870119	3	7	F	597	1790	2	230
870208	7	53	F	600	3000	2	361
870209	15	18	F	604	2175	2	372
870119	3	37	F	605	2225	2	244
870122	13	37	F	605	1975	2	311
870121	3	37	F	606	2390	7	271
870210	53	37	F	609	2160	8	380
870120	30	7	F	620	2310	1	252
870122	12	11	F	624	2500	2	306
870203	15	33	F	626	2425	2	324
870206	27	62	F	628	2460	2	347
870123	19	55	F	629	2360	2	314
870210	53	37	F	631	2300	2	384
870116	27	15	F	632	2640	2	221
870209	27	13	F	635	2450	2	368

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Lingcod (cont'd)							
870208	7	18	F	637	2210	8	362
870116	27	48	F	638	2420	8	215
870121	3	22	F	639	2420	2	268
870210	53	37	F	639	2510	2	383
870123	19	13	F	640	2420	2	312
870208	7	18	F	641	2250	2	356
870210	53	38	F	641	2575	2	378
870120	30	49	F	643	2920	1	251
870116	27	49	F	644	2600	2	214
870115	12	40	F	645	2390	2	208
870208	7	18	F	645	3075	7	357
870208	7	29	F	646	2350	2	365
870119	3	37	F	650	3430	7	239
870203	30	55	F	650	2700	2	338
870208	7	53	F	654	2390	2	360
870119	3	37	F	655	3280	2	241
870115	12	29	F	656	2670	2	212
870121	3	11	F	656	2590	2	280
870115	12	29	F	658	2760	2	211
870205	13	15	F	658	2690	2	339
870121	3	22	F	660	2950	2	262
870205	30	48	F	660	2750	2	335
870116	27	18	F	663	2450	2	217
870203	19	49	F	664	2925	2	321
870205	30	37	F	664	2800	2	334
870115	12	15	F	669	2960	2	206
870121	7	9	F	669	3190	7	276
870115	12	40	F	670	2600	2	209
870121	3	22	F	671	3180	2	265
870121	3	22	F	671	2850	2	269
870119	3	37	F	673	2850	2	242
870119	3	37	F	674	3185	7	243
870121	3	37	F	675	3380	7	272
870122	13	15	F	675	3000	2	289
870208	7	18	F	685	2840	2	354
870205	30	9	F	690	3060	2	345
870119	7	33	F	695	3640	8	225
870122	13	15	F	696	3000	2	292
870209	27	15	F	697	3280	8	369
870209	15	59	F	701	3000	8	376
870115	12	29	F	702	3920	2	210
870205	30	9	F	711	3680	2	332
870116	27	48	F	712	3450	2	216
870121	3	37	F	714	3590	2	273
870122	13	15	F	714	3690	2	287

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Lingcod (cont'd)							
870206	27	31	F	716	3745	2	353
870120	30	17	F	718	4310	7	255
870120	13	15	F	719	3860	1	249
870121	3	22	F	719	3875	2	264
870120	13	15	F	720	3610	1	248
870121	3	22	F	720	3750	2	261
870210	53	24	F	720	3925	2	386
870205	30	9	F	721	3800	2	346
870203	30	55	F	721	3610	2	337
870121	7	37	F	722	4100	2	284
870120	30	17	F	727	3800	1	258
870119	3	7	F	728	4300	8	231
870116	27	33	F	729	4475	2	222
870205	30	9	F	730	3870	2	342
870119	3	37	F	737	3725	2	245
870123	19	33	F	739	5620	7	317
870203	15	33	F	750	4450	2	325
870205	30	9	F	750	3240	2	331
870120	30	17	F	751	5475	1	257
870122	13	15	F	756	5190	7	290
870119	3	7	F	759	4280	8	232
870122	12	11	F	765	5150	7	307
870120	30	17	F	770	5355	7	256
870209	15	59	F	772	4180	8	375
870121	3	37	F	774	5490	7	275
870119	3	18	F	780	5980	7	227
870120	30	33	F	785	5610	7	250
870121	3	11	F	789	4950	8	278
870123	19	33	F	790	4540	8	316
870123	19	55	F	790	4610	8	313
870210	53	37	F	792	4530	8	382
870121	3	22	F	794	6260	7	267
870121	3	37	F	795	5840	7	274
870122	13	15	F	802	6150	7	286
870205	30	9	F	806	5850	8	330
870205	30	48	F	811	5760	8	336
870116	27	33	F	830	5520	8	223
870119	3	7	F	838	6920	7	234
870123	19	33	F	839	7775	7	315
870121	3	11	F	840	6760	7	279
870122	13	15	F	855	5460	8	291
870205	30	37	F	865	8770	7	333
870122	12	33	F	884	6490	9	296
870203	15	35	F	884	7480	8	327
870122	12	33	F	886	7720	7	297

Appendix table 3 (cont'd)

DATE	SITE	DEPTH (m)	SEX	LENGTH (mm)	WEIGHT (g)	MAT	FISH
Lingcod (cont'd)							
870122	13	15	F	906	6980	8	288
870115	12	22	F	908	7220	8	203
870203	15	35	F	936	9770	8	326
870120	30	7	F	1005	13760	7	260
Cabezon							
870209	15	18		280			
870203	15	9		380			
870209	15	18		380			
870116	27	48		460			
870203	15	35		510			
870203	15	35		559			
870116	15	11		580			
870209	15	55		650	5125		

Appendix table 4a. Codes used to describe rockfish maturity stages, from Nagtegaal and Farlinger (1980), based on maturity stages described by Westrheim (1975).

Maturity code		Gonad condition
	0	unknown
	1	immature (translucent; males, stringlike; females small)
Females	2	maturing (small, yellow eggs; translucent or opaque)
	3	mature (large, orange-yellow eggs; opaque)
	4	fertilized (large, orange-yellow eggs; translucent)
	5	embryos or larvae (include eyed eggs)
	6	spent (large, flaccid, red ovaries; a few larvae may be present)
	7	resting (moderate size, firm, red-grey ovaries)
	8	resorbing
Males	2	maturing (stringlike, translucent, white)
	3	developing (swelling, brown-white)
	4	developed (large, white; easily broken)
	5	running (running sperm)
	6	spent (flaccid, red)
	7	resting (ribbon-like; small, brown)

Appendix table 4b. Codes used to describe lingcod maturity stages, modified from Cass et al. (1984).

Maturity	code	Gonad condition
	0	unknown
	1	immature; (males stringlike; females small)
	2	immature; (males flat, transparent and slightly enlarged; females, slightly enlarged)
females	3	ova are semi-transparent and less than 1 mm in diameter, ovaries fill one-third of the body cavity
	4	ova are opaque and about 1 mm in diameter, ovaries fill two-thirds of the body cavity
	5	ova are less than 2 mm in diameter, ovaries fill 80% of body cavity
	6	ova are about 2 mm in diameter
	7	ripe (ova are larger than 2 mm in diameter, ovaries visibly fill and distend body cavity)
	8	spent (ovary may be bloodshot and purple in colour, ovary is flaccid and about one-third to two-thirds of the body cavity)
	9	resorbing (ova are large to opaque and degenerating)
	10	recovering (ovaries returning to pre-ripening stage (code 3) ovaries are firm and fill less than half the body cavity, ova are small)
	11	resting (ovaries fill less than one-third of the body cavity, no ova present)
males	3	testes enlarged, filling less than one-quarter of the body cavity and white to brown in colour
	4	testes enlarged to two-thirds of the body cavity, cross-sections of the gonad will produce milt
	7	ripe (testes are large and full of milt)
	8	spent (testes are flaccid, reduced in size and may contain some milt)
	11	resting (testes are less than one-third of the body cavity, usually brown in colour and devoid of milt)